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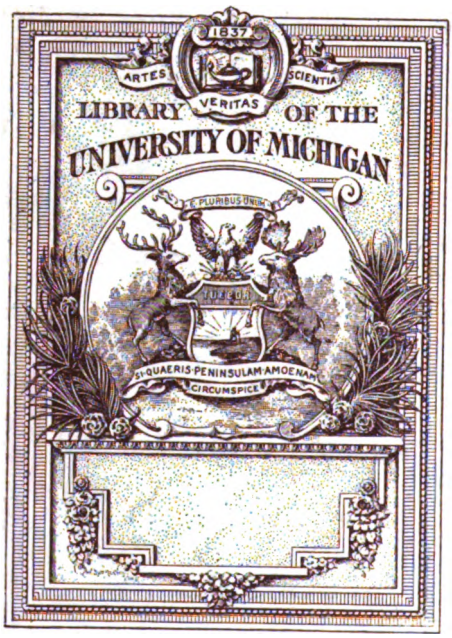

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THE MEDICAL CHRONICLE.

A MONTHLY RECORD OF THE

Progress of Medical Science.

THE TREATMENT BY DIET OF A SEVERE CASE OF DIABETES MELLITUS AND A NOTE ON THREE CASES OF DIABETES INSIPIDUS.

By W. B. WARRINGTON, M.D., F.R.C.P.,

Physician to the Northern Hospital; and Lecturer and Examiner in Clinical Medicine in the University of Liverpool.

DIABETES MELLITUS.

IN the more severe forms of diabetes the withdrawal of carbohydrates does not suffice to influence the glycosuria, and, further, the formation of acid bodies may proceed to a dangerous extent. In such cases the proteids may be considerably diminished and the requisite caloric value obtained by fat. In health proteid stimulates the metabolism of both nitrogenous and non-nitrogenous matter, and the saving effect of fat and carbohydrate is not fully experienced unless the nitrogen intake is diminished.

In diabetes the organism has lost its power of utilising the sugar carbohydrate, but, as von Noorden says, "the cells are everlastingly hungry for sugar. Although they are immersed in a medium which contains an abnormally large amount of it, they cannot avail themselves of this sugar, and consequently they are continually signalling for the mobilisation of fresh quantities of sugar." Hence there is great secondary overproduction.

In the severer form of diabetes the carbohydrate moiety of the proteid molecule is split off, and goes to the formation of sugar, and at the same time, as in health, the excess of proteid further stimulates this metabolism; but a diminution of proteid food allows the sparing effect of fat to be seen, and in the diabetic is often followed by a diminution of sugar and acid bodies. Further, the diabetic appears to be better adapted than is the healthy man to protect his proteid from destruction by the use of fat.

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The case I mention is a good example of the beneficial effects of this method of treatment, originated by von Noorden :—

M.S., male, æt. 28, was discovered to be suffering from glycosuria about a month before admission. He complained of diarrhœa, and had the typical tongue and harsh dry skin of the diabetic. There was a marked tendency to somnolence. The knee-jerks and ankle-jerks were absent. There was no lesion in the lungs or in the eyes. He was passing about four and a half litres of urine and 250 grammes of sugar, but no acetone; neither casts or albumin were present.

On withdrawal of the carbohydrates considerable improvement took place. The sugar decreased about 100 grammes per diem, and the weight increased.

No further reduction occurred on the administration of opium, codeina, alkalies or the acid extract of duodenum, a substance which, following the discovery of Bayliss and Starling, Dr. J. H. Abram has used with some success in grave cases, but which in my practice has not been of service.

I place in tabular form the result of dietetic treatment for a further period of three months :—

Date.	Weight lbs.	Urine cc.	Sugar. Grammes.	Nitrogen in Urine. (Hypobromate)	Acid Bodies in Urine.	Diet. N - Calories. Grms.	
March 14	136	2700	159	9·9	0	11·6—1647	2 eggs, 4 oz. bread, 4 oz. butter, 6 oz. meat, 6 oz. green vegetables.
19	128	1500	145	11·7	0	—	—
20	—	—	—	—	Acetone	17·5—1694	Fat bacon (4), eggs (3), beef (6), green vegetables (6), butter (4), fish (2), cream (2).
31	132	3300	151	18·7	Acetone Fe_2Cl_6 +	—	—
Apr. 7	130	2450	157	15.8	,,	—	—
10	—	2300	148	13·4	,,	17·5—1834	The same + 2 oz. mashed potatoes.
21	135	3100	171	11·9	No acetone $Fe_2Cl_6 = 0$	—	—
30	—	—	—	—	Ace tone Fe_2Cl_6 +	—	—
May 4	—	—	—	—	—	9·5—2970	Oatmeal 10 oz., butter 10 oz. 4 eggs.
10	143	2350	108	6·5	Acetone $Fe_2Cl_6 = 0$	—	—
11	—	—	—	—	—	4·6—2260	3 eggs, 3 oz. fat bacon, 8 oz. butter, with green vegetables.
14	—	1700	15	3·3	Acetone Fe_2Cl_6 +	—	—
18	143	1750	8	6	,,	—	—
24	—	—	—	—	—	—	Oatmeal diet.
27	—	1900	71	4·8	,,	—	—
29	—	—	—	—	—	17·5—1694	Diet of March 20th.

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On this diet his metabolism remained stationary for two weeks; he then left the hospital, and was instructed as to the food recommended. Some time later, when seen in the Out-Patient Department, he had maintained his weight, and appeared in fair health. During observation in the hospital the patient was kept in bed.

Several points are brought out by a consideration of the table. Under the first diet (March 14th), which was of a low caloric value and contained 4 ozs. of bread, the patient lost weight, but the acid bodies did not appear. The only effect of the second diet was to increase the nitrogen output, and the withdrawal of the small amount of bread caused the appearance of acetone and diacetic acid. Next the addition of 2 ozs. of mashed potatoes was sufficient for eleven days to prevent the appearance of the acetone reaction.

A marked change occurred on the diet of oatmeal, butter and eggs, the sugar greatly diminishing and the acid bodies were not present in the urine. When the proteid intake was further diminished, the patient was still able to establish nitrogenous equilibrium, the sugar greatly diminished, but the ferric chloride reaction became marked and did not again disappear, although 120 grains of alkali were being given.

In the most favourable cases of this treatment the acid bodies as well as the sugar diminish or even disappear.

It would appear that this patient is in a state of grave danger as the acidosis is permanent and independent of the variety of food, yet some such survive a number of years, and there can be no question that the diminution of proteids with a high caloric value from fat was best for him.

Diabetes Insipidus.

Although polyuria is a symptom found associated with many abnormal states, its persistence as diabetes insipidus is one of the rarer diseases of medicine.

Ralfe says that only eight cases were admitted to the London Hospital in twenty years, and Futcher, in his admirable paper in the *Johns Hopkins Hospital Reports* for 1902, says that the disease was only met with in four out of 356,637 cases treated there.

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Clinically the division is usually made into the primary or idiopathic cases with no physical basis for the disease and those which are secondary or symptomatic.

I have had three cases under observation in the last four years. One, sent to me by Dr. Richard Jones, of Festiniog, was a worker in a quarry a man æt. 55. He was severely injured on the head, was rendered unconscious for two days, and then passed into a state of excitement. There was slight paresis of the left arm and leg with exaggerated knee-jerks. Soon after the accident he began to suffer from thirst, and passed six to seven litres of urine free from sugar. He suffered from aching pains in the arms, severe headache and vertigo, and lost the sense of smell in both nostrils. Dr. Jones considered the base of the skull had been fractured, and a curious symptom was present which seemed to indicate the escape of cerebro-spinal fluid through the nose.

The patient insisted that clear fluid occasionally trickled away from the nostrils and at other times passed into the back of the pharynx. I was unable to verify this, but it is consistent with the injury and the anosmia. It appears to be an essential factor in the traumatic cases that brain substance itself should have been injured, though the region is indifferent. Consciousness is hence nearly always lost. The patient became considerably depressed, but otherwise his health did not seem to suffer much. It is known that the polyuria persisted for many months after he left the hospital. Iodide of potash was the only remedy which seemed to diminish the amount, and this drug is a valuable remedy in treating some of the after effects of concussion.

The second patient was Maria D., an Italian woman, æt. 35. She gave a curious history. Some three years ago, after drinking water from a holy well in Italy she was seized with burning sensations in the epigastrium, and since then had suffered from great thirst. The amount of urine voided per diem during her stay in the hospital varied from seven to eight litres, and reached in one day over 10,000 c.c. She was an obviously wasted woman, weighing only six stones, with dry harsh skin and a red cracked tongue; constipation was very pronounced. Some suspicion was raised as to the existence of tubercle, a not

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infrequent complication—at the right apex of the lung. There was distinct tenderness over the epigastrium, but no dilatation of the stomach could be discerned. The knee-jerks were very brisk, but no other change in the nervous system found. The patient was given an addition of two pints of milk to the ordinary hospital diet, and no restriction was placed on water. Various drugs were tried, including valerian and ergot, but the most benefit was derived from opium, which was increased from 2 to 5 grains a day.

In two months the weight had increased 12 lbs., a much greater regularity of the bowel action had been obtained. The patient was fairly cheerful and did not appear to suffer any mental anxiety.

The etiology of this case is quite obscure. The history seems to indicate a psychical cause, but the patient presented no manifestations of hysteria; perhaps it is to be referred to an alteration in the sympathetic nervous system.

The third case is interesting, since an elaborate analysis of the urine was made by Dr. Moore Alexander and myself.

The patient was a female child, æt. 8. She was much emaciated, weighing only 38 lbs., and presented a typical appearance; the skin was harsh and dry, the tongue and fauces red, and with a raw glazed surface; thick tenacious secretion hung about the mouth and lips. The thorax was pigeon-breasted, but no tuberculous lesion could be detected in the lungs.

There was a continual craving for water, but solid food was refused. The stools were hard and constipated; the pulse small and feeble, and the blood-pressure low (90 mm.). The amount of hæmoglobin equalled 65 per cent., and the number of red cells was 3,200,000. There was no lesion of the nervous system, though the knee and ankle-jerks were considerably exaggerated.

One of the child's brothers had died from phthisis at the age of nine years, and two sisters from convulsions in infancy.

The thirst and polyuria had been noted some time before admission. The urine varied from 2,840 c.c. to 4,118 c.c., and its nitrogen, chlorides, phosphates and sulphates were carefully determined. The diet was milk and a weighed quantity of other

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foodstuffs. Analysis showed that the metabolism was practically unaltered; the nitrogen output varied with the food; this is the rule, and the so-called cases of azoturia are merely those in which, owing to a voracious appetite, a large amount of proteid food is consumed. So also the chloride and phosphorus outputs were normal. The relation between the inorganic and organic sulphates was also normal; thus during a number of days in which the total inorganic sulphates amounted to 7·52 grms, the organic sulphates equalled 0·7 grm., or a proportion of 10:1, which, according to Hopkins, is the normal relationship. In diseases attended by disturbances of intestinal absorption the organic sulphates are, on the contrary, found increased.

It has been much debated whether patients with diabetes insipidus pass more urinary water than the fluid intake. Measurements have been given by some observers to show that this actually does at times take place, and this child on admission presented all the appearances of a dehydration of the tissue; the specific gravity of the blood has also been found increased (Futcher). Such a condition, however, cannot be persistent. The causation of the disease here was probably to be traced to malnutrition. Ralfe says: "It is the children of the poorer London districts which furnish the bulk of the younger sufferers from this disorder.

The treatment adopted, after the cleansing of the foul mouth was an ample diet of milk and finely minced meat, and as a drug arsenic was given with some ergot. The nutrition considerably improved, ten pounds of weight was added, the skin lost its withered appearance, constipation was lessened and the polyuria sank to 2,800, at about which figure it remained constant.

It is well known that treatment is often ineffectual in diabetes insipidus, and it is difficult to give adequate reasons for the employment of certain drugs. Specific remedies must be used in syphilitic and tuberculous subjects, and perhaps iodide of potassium does good in traumatic cases. Arsenic may be relied upon to improve the general nutrition, and Trousseau's experience with valerian is well known.

I give the very complete and useful classification of the

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etiology of the condition found in Stoermer's *Monograph*, published in 1892:—

1. Diseases of the central and sympathetic nervous system where actual anatomical changes occur:

(*a*) After trauma.

(*b*) After diseases of brain and spinal cord, such as brain tumours, apoplexy, syphilis, hydrocephalus, progressive paralysis, bulbar disease and diffuse diseases of the cord.

(*c*) Diseases of the cranial bones and vertebræ and meninges, and the cases following cerebro-spinal meningitis.

(*d*) After disease of the individual nerves, such as results from the pressure of aneurism and disease of the ear.

(*e*) After disease of the sympathetic nerves and ganglion, including the cases occurring at the end of intestinal disease and after Basedow's disease.

2. Diseases of the cerebro-spinal and sympathetic nervous system without appreciable anatomical changes. Under this heading come those cases which may originate as a result of the following influences:

(*a*) Psychical derangements.

(*b*) Acute and chronic alcoholism.

(*c*) Epilepsy and hysteria.

(*d*) Inherited and psychical neuropathic characteristics.

3. General injury to health, as from excessive bodily and mental activity. Effect of intense heat, poor nourishment, and particularly catching cold.

4. Infectious diseases, diphtheria, measles, scarlet fever, intermittent, typhoid and typhus fevers.

5. Cases without any discoverable cause whatever.

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SCARLATINAL NEPHRITIS.*

By ERIC M. WILKINS, M.D., M.R.C.S., (University Research Fellow in Medicine).

FOR permission to publish this work I have to thank Dr. A. Knyvett Gordon, the Medical Superintendent of Monsall Fever Hospital, where the research was carried out. He also had collected material from 50 cases before I had commenced my investigations, and the examination of sections from these kidneys formed a preliminary task to which I at first devoted my time.

In the following necessarily brief abstract I shall omit any discussion and shall, as far as possible, dogmatically state what I believe to be correct.

I especially wish to demonstrate the varieties of the disease and to point out the correlation of pathological lesions and of clinical signs.

A large number of cases have been drawn upon for the purposes of this work. I have clinically studied 100 cases of obvious nephritis and have examined sections from 100 kidneys; half of this latter group were observed during life.

I wish to draw attention to the number for the sole reason that various writers at home and abroad have rushed into print after examining less than a score of kidneys and have made deductions which are wholly unwarrantable.

It would perhaps be as well to define what is meant by scarlatinal nephritis in this monograph. Pathologically, then, the term includes those cases where there are definite microscopical variations from the normal, and clinically, those cases where there has been albuminuria present for at least three consecutive days or hæmaturia.

The clinical aspect will be first considered.

Nephritis is present in about six per cent. of all cases of scarlatina, of this six per cent. hæmaturia is present in about three per cent.

*Abstract of a Thesis awarded the degree of M.D. (Vict.), with commendation.

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It is more common in males than in females, and is especially frequent in those from 5—9 years old. It is more often seen in Hebrews than in Anglo-Saxons. The percentage varies in different epidemics and is apparently not dependent upon overcrowding or seasonal or climatic variations, but is more common in poor or previously unhealthy children.

It may be well to here point out that there is no evidence whatsoever to think that "chill" has anything to do with its causation. I kept 200 patients in bed for 2—3 weeks and let another 200 get up when the temperatures were normal; as a matter of fact nephritis was less frequent in the latter. Some consider that constipation is an operative factor of some importance. I can find no evidence to support this view. Again I am convinced by careful observation and statistical evidence from my own cases that excessive desquamation plays a very slight part at all in the causation.

The question of infectivity of the disease is of great interest and some importance. There is no doubt as to the frequency of epidemics in the wards though, of course, these may be due to a common cause. Nevertheless I am of opinion that it would be wise to isolate all cases of nephritis, just as septic cases ought to be kept separate, to avoid the infection, or reinfection, of neighbouring cases. It is the neglect of this principle, I am convinced, that makes an ordinary home a safer place for a sufferer from scarlatina than a fever hospital.

I think that it will be found that the complications of scarlatina are due to a mixed infection. As far as my bacteriological work has gone, I have found the bacillus pyocyaneus in a disproportionate number of cases of nephritis, both in otorrhœas and in the kidney after death.

There is no doubt that oral sepsis is the chief operative factor in the production of nephritis, but the problem is how to combat this. When, some months ago at Monsall, it was resolved to temporarily discontinue nasal and buccal douching, it was prophesied that the percentage of nephritis would rise and that the numbers of otorrhœa would fall.

The figures (admittedly a very small number to argue from) bore out these views.

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Out of nearly a hundred children in the "douching" period there was one case of nephritis and 22 cases of otorrhœa; in an equal number of children during the non-douching period there were 3 cases of nephritis and 8 cases of otorrhœa. The difficulty certainly is how to thoroughly cleanse the naso-pharynx without infecting the middle ear *viâ* the Eustachian tube, and I think this can best be done by careful swabbing and perhaps in cases with very much discharge, by douching at a very low pressure.

The cervical adenitis which so often precedes or accompanies the nephritis is probably also due to some oral or naso-pharyngeal sepsis. But certainly some cases of nephritis undoubtedly occur in patients where the faucial lesion has been very mild.

But, even here, it is curious to note that, while hospital treatment does not prevent the nephritis, it practically always prevents œdema and, usually, uræmia from occurring.

This is, perhaps, the most appropriate place to mention some investigations I made about the diacetic reaction in scarlatina. I found that the character of the reaction varied directly with the septicity of the case, and its long duration frequently boded the supervention of a complication, usually nephritis.

The following statistics, mostly in children from 3—8 years of age, are instructive:—

AS TO MORTALITY.			
Total number of cases - - 200	deaths 10		mortality 5 %
Cases with no reaction - - 37	,, 0		,, 0 %
,, ,, moderate reaction - 120	,, 3		,, 2·5 %
,, ,, marked ,, - 43	,, 7		,, 17 %
AS TO COMPLICATIONS.			
Total number of cases - - 200	complications 65		percentage 32·5 %
Cases with no reaction - - 37	,, 9		,, 25 %
,, ,, moderate reaction - 120	,, 30		,, 25 %
,, ,, marked ,, - 43	,, 26		,, 65 %

Complications include rhinitis, adenitis, otitis, nephritis, endocarditis and synovitis—in order of frequency).

To anticipate the pathology for a moment I should say that the septic state produces an early interstitial nephritis (marked by few clinical symptoms except sometimes slight albuminuria); many of these septic cases are fatal; when they are not, the damaged condition of the kidney paves the way for the later changes which are especially apt to occur during the third week

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owing to an accumulation at that time of many slight predisposing causes.

It is now necessary to give a classification of the varieties of the disease. I must especially call attention to my use of the term "post-scarlatinal" to denote that form which occurs *after* scarlatina, and not to the form (occurring *during* the disease) which, for some queer reason, has got this name. There are two main groups, that occurring while the patient is still infectious, and that occurring after convalescence has been thoroughly established, and indeed not being usually obvious for months or years.

CLASSIFICATION OF NEPHRITIS IN SCARLATINA.

	Clinically.	Pathologically.	Numerically (Verified by P.M.).
(A) Scarlatinal.			
1. Initial	(α) Pyrexial	Catarrhal	2
	(β) Toxic	Degenerative	11
2. Intermediate	(α) Septic	Acute focal interstitial	59
	(β) Hyperseptic	Acute diffuse interstitial	9
3. Late	(α) Acute Specific	Glomerulo-tubal	6
	(β) Sub-acute Specific	Glomerulo-interstitial	6
(B) Post-Scarlatinal.			
	(α) Sub-chronic	Sub-chronic glomerulo-intersititial	5
	(β) Chronic	Chronic glomerulo-interstitial	2
			100

The first group, then, is "scarlatinal," and this is again divided into three—the early, the intermediate and the late forms. The early form is a catarrhal or degenerative change for the most part, and occurs in cases which die in a few days from the onset of the disease, from virulent toxæmia. The intermediate form is overwhelmingly the most common one to be found post mortem and is invariably associated with the septic type of the disease. When death does not occur, this variety, like the early form, undoubtedly predisposes to renal affection later on in the course of the disease. Moreover the retardation of toxin-excretion which must functionally be present plays no small part in the production of the frequently fatal result of septic cases.

The diacetic reaction in these cases is invariably present;

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albuminuria is common but is somewhat rare to find many casts or renal cells in the urine; hæmaturia is occasionally present and may be extreme; the excretion of urea is usually deficient.

Pathologically the lesions are characteristic, though they may be present in any severe septicæmia such as puerperal fever. Macroscopically there is often no obvious change, though the kidney is frequently slightly enlarged, somewhat opaque, and perhaps dotted with patches and streaks that, to the naked eye, look like purulent infiltrations. The cortex is swollen out of its normal relation to the medulla and its markings are obscured; the Malpighian bodies are seldom distinguishable. Microscopically there is one fundamental change which is at once obvious; this consists of numerous circumscribed cellular infiltrations. I have here no space to describe their distribution. They are composed of cells which are derived mainly from the mononuclear leucocytes of the blood. These are some of their characteristics:—They are apt to vary widely in dimensions but are usually large, between the size of a polynuclear leucocyte and that of an epithelial cell from a convoluted tubule. The nucleus is large and stains deeply with such dyes as hæmatein and contains a large number of coarse chromatin granules which are connected by an indistinctly visible network; there are no true nucleoli; the nuclear membrane stains deeply and is beaded at irregular intervals by intensely staining granules; the nucleus is never vesicular and the matrix stains evenly and deeply as a whole; with regard to the protoplasm the nucleus occupies a characteristically eccentric position; in shape the nucleus varies markedly; though usually round, it is often deeply notched or slightly indented, and kidney, wine-bottle, horse-shoe or mush-room shaped nuclei are often seen. In the glomeruli, where they are appearently subjected to greater pressure, the nuclei are often somewhat elongated and pyriform or comma shaped. There is usually only one nucleus in a cell, but two are sometimes seen and even three in rare cases. It is quite common to see a nucleus apparently on the point of direct amitotic division. Karyokinetic figures are not rare, the diaster form being most often seen.

The circum-nuclear protoplasm varies in quantity but is

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usually considerable; it is very apt to present protrusions suggestive of amœboid movement; most often the shape is roughly circular.

There is, apparently, no cell membrane, and the protoplasm is dense and finely granular and stains faintly, though more deeply than the epithelial cell, with hæmatein. With alkaline methylene-blue the protoplasm stains deeply blue even after counterstaining with eosin, whereas epithelial cells turn a delicate lilac colour. Degenerative changes in these cells are rare, but I have observed a few fatty droplets. It is interesting to note that though these cells are formed from the lymphocytes of the blood, a differential blood count does not reveal a relative excess of the latter, compared to the polymorpho-nuclear variety.

I have purposely described these cells at some length, because they are the predominant feature in the common type of scarlatinal nephritis.

These cellular infiltrations have been produced experimentally in the kidney of a rabbit by injecting into the circulation a filtered culture of the staphylococcus aureus, and also by feeding the animal on acetone. Inasmuch as the diacetic reaction is clinically present in just these cases of septic nephritis the significance of the latter experiment is extreme.

In addition to these groups of round cells there are degenerative and proliferative changes of the glomeruli and blood vessels, which are slight in amount, and, I think, unimportant.

In cases associated clinically with pyæmia, there are purulent emboli in the blood vessels and collections of micrococci; these latter are most often seen in the glomeruli.

In the cases with hæmaturia, extreme congestion and rupture of the glomerular capillaries are added to the other lesion. Such cases are often associated clinically with a collection of pus somewhere or other in the body; when this is evacuated, the hæmaturia subsides.

The "hyperseptic" form is more characteristic pathologically than clinically. The enormous size of the kidney is the first striking feature. I have had renal organs each weighing 15, 18,

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or even 20 ounces in boys of nine (where the normal weight is less than 3 ounces).

The congestion is extreme; there is an almost complete lack of structure markings, and the kidney often looks much like a spleen in colour and consistency.

Microscopically, little else is to be seen but a mass of round cells which have overwhelmed every tissue in the cortex, and to a somewhat slighter degree in the medulla. It is marvellous how few clinical signs are produced by these lesions—a varying amount of albuminuria, deficient urea excretion, a few casts and a considerable degree of oliguria, this is all, with, perhaps, slight uræmic manifestations.

Most writers have not come across these cases, which amount to 10 per cent. of the whole number. Friedlander and Councilman (to whom I am much indebted) alone describe this condition.

Clinically it is marked by extreme septicity. Thus in one case there was gangrene of the lips and gums and necrosis of the mandible. In another there was foul, sloughing cellulitis of the greater part of the neck with bilateral panophthalmia.

The treatment of these two types of nephritis I shall consider when I come to the treatment of the better known variety which occurs at a later date, and which is the next form to be discussed.

So much for the "intermediate septic" types of scarlatinal nephritis; we now come to that variety which is as overwhelmingly frequent *clinically* as acute interstitial nephritis is *pathologically*, and which I have therefore termed "specific" or "late" scarlatinal nephritis. Whenever "nephritis" is mentioned in connection with scarlet fever, this is almost invariably the variety that is meant. I should say that whereas 100 post mortem examinations of scarlatinal patients would reveal at least 60 per cent. of septic nephritis, more than 80 per cent. of cases of clinically obvious nephritis are of the "specific type." This is merely because the septic cases die and the "specific" cases do not.

It is curious with what punctuality this deferred form of nephritis occurs: 90 per cent. of cases make their appearance between the 16th and 26th days and the 21st day is an especially common date. The latest I have recorded was on the 39th day.

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About the prodromata there has been much discussion; in this place I shall only give my own view.

Very often an attack of cervical adenitis immediately precedes the albuminuria—whether it is definitely associated with the renal inflammation is difficult to say.

A drop in the urea excretion, if this is being daily estimated, is the first actual sign of nephritis and is soon followed by slight oliguria. On the second day there is often slight pyrexia, constipation, and a pulse of high tension. On the third day there is malaise with headache and anorexia, and sometimes nausea and finally albuminuria and hæmaturia. Leucocytosis is stated by Bowie to be an early sign. Œdema and anæmia are, of course, late symptoms, but in general practice are often the first to attract attention. The case now passes from the prodromal to the acute stage.

Oliguria is usually slight but is sometimes profound; it is by far the simplest guide to the progress of the case, though variations in the excretion of urea are really the most important feature.

Uræmia is not very rare but is seldom fatal. In one case that I observed there was anuria for three days with coma, convulsions and blindness. Perfect recovery ensued. Uræmic fits may be the first *obvious* symptom of the disease when the case has not been closely studied.

Albuminuria is usually at its height at about the fourth day and lasts a very variable time, usually about a month. Hæmaturia is often most marked on the first day and rapidly decreases. Much albumen is a worse sign than much blood. An average percentage of albumen is about ·6.

Casts are invariable, and mostly consist, as the disease runs its course, of hyaline matter, epithelium and erythrocytes, and finally, fatty and granular débris.

Cardio-vascular changes rapidly occur, with an increased pulse-tension and a hypertrophied and dilated heart. I have seen two cases of acute dilatation and rapid death.

Albuminuric retinitis is rare, but does occur (Brudenal Carter). I have only seen it once and then in the chronic form of scarlatinal nephritis.

A blotchy erythema often accompanies the nephritis.

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The prognosis, being a point of practical importance, I should like to discuss in a less "sketchy" way than the previous points.

Death is always rare—the mortality being about 6 per cent. of those cases with hæmaturia and oliguria—and is usually due to uræmia or heart failure in adults or to broncho-pneumonia or other secondary inflammations in children. Uræmia generally reacts well to treatment, though coma is a more unfavourable sign than convulsions.

Marked anasarca may be associated with pulmonary water-logging or with œdema glottidis; both are very rare.

Favourable signs in the acute stage are a soft, moist skin, good diuresis, plentiful urea-excretion, a low tensioned pulse, and free diaphoresis after treatment by baths or packs.

Persistent vomiting is a very bad sign, and so is anuria.

Acute cardiac dilation may produce a fatal result in a case that is otherwise doing well.

As for more remote prognosis, the liability to secondary suppurative inflammations, such as empyemata, should be borne in mind for the first month or so.

A persistently high pulse-tension very often means that the renal condition is also becoming chronic.

Exacerbations of acute nephritis are apt to occur for a few months, and moreover, while it is rare for the condition to become chronic, this certainly sometimes occurs, as I shall mention later.

A case can only be considered cured when the daily amount of urea excreted is normal, and when albuminuria has been absent for a month.

The pathological basis of this clinical condition is well known; it consists of a typical glomerulo-nephritis with a variable amount of tubal affection. There is marked cellular proliferation in the glomerular tuft followed by degeneration; Bowman's capsule and the walls of the blood-vessels undergo hyaline swelling and the glomerulus ultimately atrophies. As for the secreting tubes, fatty degeneration is invariable, while other forms of degeneration usually occur together with catarrh and desquamation.

I am making no attempt in this short abstract to describe

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the pathological part of my work, as this is hardly of interest to the general medical man.

I pass to the treatment, where opinions vary in an extraordinary manner.

And here it is necessary for a while to touch upon the treatment of the septic forms of nephritis, which occur at an earlier date, and which certainly pave the way for the variety which is clinically more obvious, if not more important.

Anyone who has, pathologically, observed the large areas of kidney substance which are sometimes functionally destroyed, and has, clinically, noted the commonly concomitant deficient urea excretion and occasional oliguria, must be impressed with the need for giving the kidney every possible assistance in its task. The over-worked organ usually gives no marked clinical signs of distress at this time because the pathological lesion is essentially one of *areas* and not of *structures,* while in the later "specific" nephritis of the third week the *glomeruli as a whole* are the primary seat of the attack, and at once make their affection obvious by oliguria and albuminuria.

Hence, while the later form of nephritis is universally recognised, the more common and, possibly, equally important earlier form, here termed "septic" nephritis has hitherto almost entirely escaped recognition.

The two clear indications are to decrease toxin-absorption and to increase toxin-excretion by other paths than through the kidney.

Firstly, then, sloughing tonsils and adenoids, and all badly carious teeth should be removed, without an anæsthetic, which probably irritates the kidneys in these cases.

The tonsils and pharynx should be frequently swabbed out and douching should be employed in those cases where other means fail to keep the parts clean.

Any localised collection of pus, or even cellulitic patches, should be early incised.

If there are any signs of mastoiditis, the antrum should be opened and drained; in many cases, examined post-mortem, mastoiditis, unsuspected during life, has been found; it is, I believe, the commonest cause of scarlatinal pyæmia.

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It is better not to open and drain joints unless the signs of suppuration are quite clear, and in any case the "minimum of surgical interference" here, as always, is the best for the patient.

So much for the diminution of toxin-absorption.

The next point is to assist toxin-excretion, and this and subsequent remarks on treatment apply chiefly to the late "specific" form. The primary object is obviously to throw open to their fullest extent the two supplementary channels of elimination—the bowels and the skin.

The patient should therefore be kept in bed in a warm room, and should have sufficient baths to keep the skin moist, and sufficient saline purgatives to keep the bowels freely open.

Dieuretics should be avoided, though where there is oliguria plenty of bland fluids should be drunk.

The food at first should be mostly free from nitrogenous matter, and the best guide to diet is the adequacy of the urea-excretion; and if this is good the diet may be less strict.

After a few weeks, even if albuminuria is still present, a partially proteid diet is often advisable, and the patient may be allowed to get up if the condition of the kidney seems stagnant. Though unorthodox, this treatment has been shown by experience to be effective (especially if iron is simultaneously exhibited) in cases where improvement has come to a standstill.

As preventive measures the routine administration of urotropin and helmitol have been widely advised.

I do not consider this treatment necessary or even desirable.

Again, many have recommended that all scarlatinal patients should be kept in bed for three weeks and fed on farinacea and vegetables till the dangerous period is over.

This is simply unnecessary cruelty in the case of the slum-child, who is the commonest denizen of a fever-hospital, and who usually most needs fresh air and plenty of good food to ensure a speedy convalescence; after abundant experience I find that children do much better when they are allowed to get up when they feel fit, and to eat when they feel a craving for food. I think very strongly that instinct is right more often than is commonly supposed at the present day in matters of health.

For instance, though of course this is no new idea, I find that

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septic cases do very well when they are placed out of doors at all times when the weather is propitious.

Just a word here about urea-excretion in scarlatina.

I adopted this as the most convenient clinical method of estimating renal efficiency at various stages of the disease.

After a considerable amount of work I was able to express by graphic curves the normal excretion in scarlatina and also the decreased excretion when the various forms of nephritis set in.

The amount of urea being expressed in hundred-thousandths of the body-weight, a method that was essential for purposes of comparison in children of different sizes and weights.

It is characteristic of scarlatinal nephritis (as Barlow and also Kolisch have pointed out) that the basic purins are in excess compared with the acid purins, probably because the xanthin bodies are excreted with more ease than the more highly oxidised uric acid.

I pass on to what is really another variety of the "late specific" type. Clinically, it is marked by an insidious apyrexial onset with progressive albuminuria, and ultimately all the symptoms of renal involvement, such as decreased urea-excretion, oliguria, high arterial tension, anæmia, and, finally, œdema, cardio-vascular changes and possibly secondary inflammations. Hæmaturia is not common in this type, but may occur. The prognosis is worse in these cases of "*sub-acute* specific nephritis" than in the acute variety, and the kidney may pass into the small, hard, pale, granular contracted state. The pathological conditon is that of a cellular interstitial nephritis co-existing with a glomerular affection. The causation is obscure; the acute nephritis is suggestive of sudden infection or overwork; but this type is suggestive of the gradual breaking down of the efficiency of an organ under excessive and continuous strain, such as the slow accumulation of the scarlatinal toxin.

It is preceded in many cases by early albuminuria, and the local faucial lesions have usually been severe in this type. It often passes on to the varieties of nephritis which are about to be described—the truly post-scarlatinal group.

The first of these is the *sub-chronic* scarlatinal form, which is

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in reality an occasional transitional or penultimate stage common to the main varieties of acute or sub-acute scarlatinal renal involvement.

Any of these varieties *may* clear up, and indeed usually *do*, but sometimes a state of renal cachexia slowly makes itself manifest. There is a definite persistent anæmia, slight albuminuria (but practically never hæmaturia), constant high arterial tension, some small degree of cardiac hypertophy and a continually deficient daily excretion of urea.

Acute exacerbations of acute renal affections may occur. This type is not quickly fatal, and I have only obtained sections from patients who have died from intercurrent disease. It forms a most interesting link between the acute and the chronic varieties of scarlatinal nephritis. Pathologically it is marked by a diffuse development of an interstitial intertubular fibro-nucleated tissue, more or less cellular, by tubal catarrh and degeneration and by fibrosis of the glomerular tuft and its capsule.

It is possible to trace the gradual changes which ultimately end, if improvement does not occur, in the supervention of *chronic post-scarlatinal* nephritis.

This latter form is certainly rare, but as certainly does occur. I have observed four cases, two of which ended fatally, so that it was possible in these to make a pathological investigation. All four were in children, of 7, 9, 7 and 16 years respectively, and all dated their illness from scarlatina *about* two years previously. In each case the symptoms, when I came across the patient, were for the most part typically those of the granular kidney, so that I do not intend to describe them.

There had been an intermediate period of indefinite ill-health while the symptoms had been continuous, though gradually changing in character. For example, cardio-vascular changes had become marked and the urine had become plentiful. The kidney lesions were typically those of a chronic glomerulo-interstitial type, and in no way differed from those found in, say, a patient suffering from chronic lead poisoning, except that in my cases the interstitial changes were rather more cellular and not so much fibrous in character.

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Conclusions.

The conclusions which I have come to are as follows :—

There is no form of nephritis peculiar to scarlatina. The most common and characteristic lesion found in the kidneys of those who have died during an attack of scarlatina is acute focal interstitial nephritis which is associated with a clinical state of marked septicity.

In those rather rare cases where death has been directly due to nephritis glomerulo-tubal changes predominate.

In a similar way it has been shown that each clinical variety of scarlatina is represented pathologically by a definite group of changes, and that, *vice versâ,* after examination of a kidney it is usually possible to mention the symptom-group that was present during life, if death was due to scarlatina.

But in death due to intercurrent disease or accident there may be no renal alterations; it is only in cases of infection serious enough to produce a fatal result that lesions are invariably found.

The earliest change is the congestion and slight tubal catarrh of the first few days, and is mainly due to pyrexia.

Then follow the parenchymatous and vascular degenerations due to the acute infection of the virulent " toxic type " of scarlatina which often proves fatal in the first week.

If the toxæmia is less fulminating and more gradual the next observable change is the emigration of the mono-nuclear leucocytes forming foci of round-cell infiltration, the degree of which seems to depend upon the general septicity of the case. In the toxic types the faucial lesions are slight and the renal changes degenerative, while in the septic type there is extreme oral, nasal or faucial involvement with essentially exudative renal phenomena.

Moreover, in septic nephritis, glomerular swelling and nuclear proliferation rapidly occur, though this is much more marked in the "specific" cases, where the glomeruli are the primarily seat of attack and where the apparently concomitant tubal changes are mainly due to interference with their vascular supply through blockage of the glomerular capillaries.

It is clear that transitional cases, clinical and pathological, must frequently occur.

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Any of the acute forms of the disease may run into the chronic interstitial variety, though this is rare.

It is characteristic of the scarlatinal kidney that the changes are peculiarly "patchy" in distribution, and follow no definite rule. Even in the "specific" variety groups of glomeruli are picked out for attack.

From a purely clinical standpoint the chief items of interest are the following:—

Beyond the fact that scarlatinal nephritis is probably due to a combination of toxic absorption of a bacterial origin and of decreased excretion, little is known as to its etiology.

Certainly "chill" is not an operative factor of importance, and it is unnecessary and unwise to keep children in bed and on low diet in the hope of preventing this complication.

The most hopeful line of prevention is by the isolation of septic or nephritic cases, by treatment of oral and faucial sepsis and by the injection of anti-streptococcic serum in toxic cases.

The early recognition of the disease is important; few conditions are more amenable to treatment.

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CHRONICLE.

Medicine.

An Investigation on the Dorsal Foot Reflex.

LISSMAN (P.). *Muench. med. Wochenschr.*, May 21, 1907.

A FEW years ago K. Mendel described a reflex which he regarded as a reliable sign in distinguishing between organic and functional paralysis. It is obtained by striking with a percussion hammer the outer border of the dorsum of the foot over the cuboid and outer cuneiform bones. In normal individuals this causes a reflex extension of the second and third, or even of the outer four, toes; while in organic spastic paralysis dependant on disease of the pyramidal tracts the reflex takes the form of flexion of these toes. When the peripheral neurones are involved the reflex is naturally absent.

Lissman has investigated the value of this reflex in a large number of cases, both in healthy individuals and in cases of nervous disease. He found that the extension type of the reflex is constantly present in the healthy person and in such diseases as tabes dorsalis; while in most cases in which the Babinski sign is present, that is, in which there is evidence of disease of the pyramidal tracts, the reflex movement of the toes is plantarwards. Plantar flexion was never obtained where Babinski's sign was absent, so the percussion reflex can be only supplementary to the better known test.

The examination of children also gave interesting results. As is well known, stimulation of the sole of the foot in infants during the first three or four months of life causes extension of the great toe (positive Babinski), and in such cases percussion of the dorsum of the foot results in reflex flexion of the toes, that is, in the pathological type of reflex; finally, the percussion reflex assumes the normal type in children coincidently with the disappearance of Babinski's sign. GORDON HOLMES.

On Congenital Defect in the Functions of the Motor Cranial Nerves.

NEURATH (R.). *Muench. med. Wochenschr.*, June 18, 1907.

CONGENITAL palsy or absence of one or more of the cranial nerves, which was first described by Moebius, is almost invariably

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bilateral and symmetrical. Only the motor nerves are affected; those supplying the ocular muscles are the most frequently involved, and next in frequency the facial muscles and the tongue. The condition is characterised by its existence from birth, by the fact that it remains stationary, and by the absence of electrical reaction, of fibrillation and of all tendency to contracture in the muscles which normally are supplied by the affected nerves.

In the case described, the child died when six weeks old; there was bilateral facial palsy with absence of the electrical excitability of the muscles, and unilateral paralysis of the palate, but the ocular muscles escaped. There was further evidence of anomalous development in enormously large ill-shaped pinnæ which contained no cartilage, and colombata of the choroid and sclerotic. On post-mortem examination several other anatomical anomalies were found in the visceral organs; but nothing abnormal could be detected in the nuclei or motor roots of the pons or medulla oblongata. It is consequently assumed that, unlike the cases which have been previously examined, the absence of function in the facial muscles was due to a primary agenesia of these muscles. GORDON HOLMES.

A New Type of Ataxia.

STARR (M. A.). *Med. Record,* May 18, 1907.

THE patient whose case is described, a man 66 years of age, began to get deaf eight months ago; the deafness had the character of nerve deafness, and was gradually progressive till it became complete. Coincidently with the progress of the deafness he began to stagger and to find that he was unsteady on his feet even in standing. This also increased until he became unable to stand or walk alone. No other sign of organic nervous disease was present, and there was no ataxia of the upper limbs. The diagnosis—it has not been confirmed—suggested is atrophy of the cochlear and vestibular nerves. As a result of the atrophy of the vestibular nerves those impulses from the labyrinth which are necessary for the preservation of balance are cut off from the brain, and to this the difficulty in equilibration may be ascribed. GORDON HOLMES.

A Case of Hysterical Mutism.

MITCHELL (J. K.). *Journ. of Ment. and Nerv. Diseases,* April, 1907, p. 253.

A MAN, 22 years of age, lay in a semi-conscious state for twenty-four hours after coming in contact with a live electric wire, though it was doubtful if he had received much direct injury.

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From that date he uttered no articular sound, and could not even whisper for fifteen months, yet he could write intelligently; in his own phrase, he "wanted to speak, but did not know how to go about it." He complained of headache at times, but there was no sign or organic nervous disease. The laryngeal functions appeared normal, except that the vocal cords, which were easily approximated, flew apart at the slightest attempt at phonation. The hysterical nature of the case was also indicated by the complete reversal of the visual colour fields for red and green. All methods of treatment failed, but he at last regained speech suddenly and completely after a convulsive seizure, which was evidently hysterical.

Although some loss of speech (aphonia) is a common hysterical manifestation, such complete mutism is extremely rare.

GORDON HOLMES.

The Diagnostic Value of Lumbar Puncture in Psychiatry.

POMEROY (J. L.). *Journ. of Ment. and Nerv. Diseases*, April, 1907.

THIS paper is devoted chiefly to the consideration of the state of the cerebro-spinal fluid in syphilitc and para-syphilitic affections of the central nervous system, and in those conditions which might be confounded with them.

In nearly all cases of syphilitic infection an increase of cells, the great majority of which are lymphocytes, is found in the cerebro-spinal fluid in both the secondary and tertiary stages, and this occurs even when no clinical or pathological evidence of affection of the central nervous system can be detected. In general paralysis of the insane and in tabes dorsalis lympho-cytosis seems to be constant, and its degree and the amount of albumin in the fluid is generally considerably greater than in cases in which the central nervous system is not attacked. An absolute diagnosis of general paralysis, and especially its distinction from cerebro-spinal syphilis, is consequently not possible from an examination of the fluid alone, but when lymphocytosis and excess of albumin are present it can be with certainty distinguished from alcoholism, dementia præcox, epilepsy or cerebral tumour, in which no lympho-cytosis is found unless the case is complicated by syphilitic infection. On the other hand, the absence of any excess of cellular elements in the cerebro-spinal fluid makes the existence of general paralysis improbable.

GORDON HOLMES.

Epilepsy Associated with Acromegaly.

SHANAHAN (W. T.). *Journ. of Ment. and Nerv. Diseases*, May, 1907, p. 289.

THE author adds another case to the already long list of those in which epilepsy is associated with acromegaly. The patient, a

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woman aged 31, first showed signs of acromegaly at 22, and from her 26th year she was subject to frequent epileptic convulsions and to petit mal attacks. As a case of acromegaly she was typical.

To explain the association of the two diseases it has been generally assumed that the epilepsy is due either to the general increase of intra-cranial pressure which must result from a tumour of the pituitary gland, or that it is the result of some alteration of internal secretion dependant on disease of the hypophysis, either absence of the secretion of the gland or the failure of the gland to neutralise other secretions or toxines.

GORDON HOLMES.

Ambulatory Automatism.

PATRICK (H. T.). *Journ. of Ment. and Nerv. Diseases*, June, 1907, p. 353.

BY the term ambulatory automatism is understood a pathological syndrome appearing in the form of intermittent attacks, during which the patient, carried away by an irresistible impulse, leaves his home and makes an excursion or journey justified by no reasonable motive. On returning to normal consciousness the subject finds himself in unknown surroundings, and no knowledge remains of what transpired during the ambulatory period. Such attacks may be the result of diverse diseases. It has been observed in the post-traumatic state, after acute alcoholism, as an epileptic phenomena or an epileptic equivalent, in hysteria, and as a manifestation of psychical instability or degeneracy.

Ambulatory automatism must, however, be definitely separated from the tendency to wandering on the part of unstable or more or less defective individuals who may at any moment yield to a sudden impulse and start for elsewhere without any warning. This impulse may be based on fear, anger, weariness of occupation or environment, desire to see another locality or other persons; in short, on any of the ordinary motives of travel but on a motive utterly inadequate in degree to move a normal person. On the other hand, especially in the degenerate cases, there is occasionally a gradual passage of perfectly conscious voluntary truancy into ambulatory automatism.

The paper is illustrated by the description of six cases which the author himself has observed, but which cannot be suitably abstracted. There is also added an instructive review of the literature of the subject and of the opinions which have been expressed on the nature of the condition. He protests with emphasis and with a considerable array of argument against the general tendency to regard all these states of secondary consciousness as phenomen of epilepsy or as epileptic equivalents. That epilepsy is an important, if not the most important and

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frequent, factor is undeniable, but it is unjustifiable to consider these states as epileptic manifestations when there is no other evidence or even suspicion of this disease. Further, it has been found that when hypnotised the majority of the cases have been able to recount the experiences of the dual state of which, in normal consciousness, they retain no memory. This would be scarcely intelligible if the secondary states were epileptic in nature, but it is strongly suggestive that they are hysterical.

Even in true ambulatory automatism some motive for the wandering may be frequently discovered. That the mental character of the subject is the most important factor in the hysterical cases is undoubted, but in many it may be found that prior to an attack of wandering the individuals finds himself in or threatened by circumstances which it is advisable or expedient to avoid.

GORDON HOLMES.

Tuberculosis and Asthma; Incomplete and Secondary Asthma.

SOCA (F.). *Arch. gén. de Méd.*, Paris, 1907, i., p. 353.

IN his private practice at Montevideo the author saw 140 cases of asthma during the twelve months ending August, 1906, and attributes the frequency of the disease to the flesh-diet and arthritism that are so common in Argentina and Brazil. After very careful and complete examination, he found evidences (usually well marked) of tuberculosis in 120 of these patients; he expects the other 20 to show signs of tuberculosis ultimately.

He is convinced that tuberculosis and asthma are very closely connected. He also believes that asthma often escapes diagnosis because it occurs in the incomplete form. Asthma is due to a neurosis of the bulb resulting from hereditary predisposition; asthmatic attacks are due to spasm of the muscles of inspiration, and of the diaphragm in particular, the bulb being excited by stimuli brought to it either by the nerves (from the bronchial or other mucous membrane) or by the blood (toxic asthma). The continuous inspiratory spasm leads to emphysema, and this emphysema is a considerable factor in the production of the dyspnœa; emphysema, dyspnœa, and bronchitis, are the three essential elements in asthma. The three chief physical signs of asthma are pulmonary hyper-resonance, prolonged expiration, and "a vèritable orchestra of" sibili; asthma has also a paroxysmal character. Soca further believes that the very great majority of patients with emphysema are really asthmatics—over 75 per cent. are so.

Incomplete asthma ("*asthma fruste*") occurs four or five times as often as the classical form. It habitually escapes diagnosis because it exhibits no dyspnœa, but only bronchitis

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and emphysema; its physical signs are the same as those of classical asthma. The subject of incomplete asthma exhibits the usual asthmatic heredity, however, and is likely to suffer from the complete form of the disease later. Exceptionally, incomplete asthma may be represented by emphysema with a minimum of bronchitis and no dyspnœa. The simplest and most deceptive form of asthma is the simple coryza; very often, repeated and obstinate colds in the head signify asthma, and this asthma betrays itself only by nocturnal attacks of bronchitis or of bronchitis and emphysema which may even remain unnoticed by the patient (though observed by the wife or husband). But patients with any form of incomplete asthma give as strong a family history of asthma as do the classical asthmatics.

Soca states that almost all chronic bronchitics are really asthmatics, unless the bronchitis is secondary to tuberculosis or to diseases of the heart or kidneys. Patients with chronic bronchitis often have little attacks or crises of pulmonary sibilation at night, with or without feelings of oppression. Soca argues that the emphysema precedes the dyspnœa, the cough, and the bronchitis in these patients; and that asthma is really a crisis of acute emphysema which may come and go in the course of a few hours. Without asthma it is impossible to explain either the occurrence of ordinary emphysema or of the paroxysmal emphysema seen in certain patients with chronic bronchitis, or their dyspnœa and chronic bronchitis.

Secondary asthma may occur as a sequela or complication of influenza or any acute infectious disease. Cardiac and renal asthma are misnamed, unless the signs of classical asthma mentioned above are present—as they often are. Incomplete asthma Soca believes to be habitually due to tuberculosis, and secondary asthma to be often due to the same cause. He gives cases illustrating his points of view, and argues strongly in favour of giving iodide to all patients suspected of any form of asthma. He has given iodide immediately after or even during hæmoptysis, and has never seen any ill-effects follow its use.

A. J. Jex-Blake.

Fatal Respiratory Paralysis.

Collett (A.). *Norsk Mag. for Laegevidenskaben*, 1907, p. 793.

The patient, a girl of 19, had had an acute attack of gout four years previously, and since that time had suffered from articular pains, shortness of breath, and swellings of the legs. On February 10th, after a period of general debility, she was suddenly seized with very severe headache, and vomiting which continued for three days; the headache persisted, becoming extremely severe, and causing the patient to cry out and throw herself

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about. Admitted to the hospital on the 15th, she answered only one of the questions put to her, speaking her name slowly and with a scanning delivery. The patellar reflexes were lively, ankle-clonus was present, no paralysis was observable, the pupils were equal and reacted sluggishly, and there was conjugate deviation of the eyes downwards and to the left. The pulse varied from 56 to 72. Morbus cordis and slight albuminuria was recorded. Lumbar puncture was performed, and a dun fluid was withdrawn which deposited a red sediment of blood-corpuscles, and was sterile. The temperature was normal. The patient improved a little during the next week, but no certain diagnosis could be made. On the 21st the patient went into convulsions, became cyanosed, and altogether ceased to breathe; the pulse was well felt, 140, and the heart's action appeared to be tumultuous and abnormally strong. Artificial respiration was begun; after it had been continued for 1⅓ hour the heart's action died away, and the previously contracted pupils expanded widely. At no time did the patient make any attempt to breathe or to move her limbs. The beating of the heart could actually be heard, as a succession of single dull thumps, at the foot of the bed for ten minutes after the patient ceased to breathe.

At the post-mortem examination a dumb-bell shaped hæmorrhage was found in the middle of the superior vermis of the cerebellum; clotted blood also formed a thin layer over the posterior half of the base and convexity of the brain and between the brain and cerebellum. Examination of the vermis showed that the clot on its left side was drier and probably older than that on the right; it occupied the place of the upper part of the arbor vitæ, ½–¾ cm. from the fourth ventricle. No evidence of tumour embolism or any vascular disease could be found in the brain, either macro- or microscopically. The heart weighed 370 grams; old disease of the aortic valves was found, and both old and recent vegetations were seen on the mitral. The spleen was soft and weighed 460 grms. Collett suggests that an embolus from the mitral valve underlay the cerebellar hæmorrhage; although fever was absent, the large spleen gave support to the idea that the patient might have had influenza, and influenza can cause hæmorrhages (nasal, renal, uterine, or intra-cranial). He points out as the particular interest in this case, that the heart survived the rest of the body for 80 minutes. A. J. JEX-BLAKE.

Alcohol, Uric Acid, and Gout.

BARTOLETTI (C.). *Riv. crit. di Clin. med.*, Florence, 1907, pp. 340, 353, 369.

THE author reviews the various views that have been held as to the influence of alcohol upon the elimination of uric acid in the

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healthy and in the gouty. Numerous authors have found that the consumption of wine, spirits or beer increased the amount of uric acid eliminated in the urine; while others have observed no increase or even a diminution in this elimination while alcohol was being taken. Pollak (1906) found that healthy persons eliminated a larger proportion of nucleic acid in the form of urinary uric acid than did gouty or alcoholic subjects, and eliminated it more rapidly also. Bartoletti has made similar investigations independently, upon two healthy persons aged 30 and 17, and two gouty albuminuric subjects aged 74 and 65. He finds that, in the healthy, the administration of as much alcohol as is contained in a litre of light Italian wine increases the elimination of uric acid in the urine for several days after its consumption. In the gouty, however, the ingestion of alcohol constantly causes a diminution in the amount of uric acid passed in the urine; hence alcohol should be forbidden in gout. The consumption of sweetbreads, which are rich in nuclein, slowly augments the excretion of uric acid in the urine of the gouty.

A. J. JEX-BLAKE.

Hydronephrosis and Abnormal Renal Vessels.

EKEHORN (G.). *Hygiea*, 1907, p. 603.

THE author has treated a case of hydronephrosis in which the condition was due to an accessory renal artery compressing the ureter, and has collected 24 similar cases from the literature. His patient, a woman of 43, first complained of pains in the right side of the abdomen six years previously; she had often obtained relief from them by lying face downwards over the arm of a sofa, so that it should press on the right side of the abdomen, and soon after the pain had thus been driven away she often had a desire to micturate. She had never seen blood or gravel in the water. For the last few months these attacks of pain had been more frequent and more severe. On examination, Ekehorn found the right kidney depressed, solid, enlarged, and tender, but less so after the patient had been in bed a few days. The ureters were separately catheterised simultaneously, and the urine was collected for one hour. The right ureter discharged 4 c.cm. of pale acid urine containing a trace of albumin, 0·45 per cent. of NaCl, less than 0·5 per cent. of urea. The left ureter discharged 20 c.cm. of normally coloured acid urine, containing 0·9 per cent. of NaCl, and over 3·0 per cent. of urea, and a trace of albumin. A little blood, due to the catheterisation, was found in each specimen; and 12 c.cm. of urine resembling that derived from the left ureter were collected from the previously emptied bladder during this period. At the operation the right kidney, and particularly its lower part, were found to be fixed by chronic

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inflammatory adhesions to the surrounding tissues; the pelvis was enlarged and distended, pear-shaped. An accessory artery, derived apparently from the aorta, and the size of a large radial artery, entered the anterior face of the kidney three-quarters of the way down it. The ureter passed up from the bladder in front of this artery, hooked over it, passed down behind it, and then passed up once more to enter the dilated pelvis of the kidney just behind it again; no ureteral stenosis was found. The accessory renal artery was divided between ligatures; after this, the lower pole of the kidney became a little cyanotic. The patient made a complete and uneventful recovery. Seven months later she was taken into hospital again for observation, and it was found that the urine from the right kidney hardly differed at all from that secreted by the left. Ekehorn reproduces 12 cuts showing how the ureter has been obstructed by aberrant renal vessels.

A. J. JEX-BLAKE.

A Case of Meningitis due to a Yeast.

TÜRK (W.). *Deutsches Arch. f. klin. Med.*, 1907, 90, p. 335.

THE author gives a long-winded account of a case of meningeal saccharomycosis. The patient, an unhealthy epileptic servant of 43, was suddenly seized with severe headache and vomiting at the end of March, 1906. The headache, vomiting, tenderness of the head, stiffness and tenderness of the neck, intermittent mental confusion, and progressive asthenia, increased to the end of April; at this time Kernig's sign was constantly present, the knee-jerks and Achilles-reflexes were often increased, ankle-clonus was sometimes observed, Babinski's sign was not made out, and the patient for the most part lay curled up in bed, with slight fever and a pulse of about 80. Lumbar puncture was practised, and 25 c.cm. of clear serous liquid were withdrawn, but the fluid was not examined. A week later the puncture was repeated, and 55 c.cm. of slightly turbid serous fluid issued, containing yeast-cells. These withdrawals of fluid improved the patient's condition; two days later 50 c.cm. of fluid were drawn off by a third lumbar puncture, and were found to contain yeast. The blood and urine were sterile; the leucocytes were 7,000 per cbc.mm.; the polymorphonuclears were 91·5 per cent., the small lymphocytes 3·6 per cent., the large lymphocytes 4·9 per cent. The patient sank, and died on May 15. Five days before death a thick membrane spread over the pharynx, gums and tongue, from which a soor-like yeast was cultivated. At the autopsy the brain was soft, the pia in the sylvian fossa a little œdematous; no tumour, tubercle, or fibrinous exudate was found about the brain. A pure culture of yeast was grown from the fluid in the cerebral ventricles. Chronic tuberculosis of the

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mesenteric glands and of the apices of both lungs was also found. The ventricular ependyma was intact. Culturally, the yeast from this case resembled the yeasts (Saccharomyces hominis, S. tumefaciens, S. neoformans) grown from other patients with saccharomycosis. Türk believes that the yeast grown from the buccal membrane was identical with that grown from the meningeal fluid, but he did not take steps to prove their identity culturally. He thinks that his case proves that the infection in saccharomycotic meningitis arises by some small lesion in the mouth or naso-pharynx. The literature of the subject is discussed at length, as are the cultural characteristics of the yeast.

A. J. JEX-BLAKE.

Oxaluria in Infectious Diseases.

MAYER (A.). *Deutsches Arch. f. klin. Med.*, 1907, 90, p. 425.

THE author finds the excretion of oxalate in the urine much increased in tuberculous patients with pyrexia. Determining the urinary oxalate by the method of Autenrieth and Barth, he found the daily elimination of oxalic acid to be 0·05—0·08 gram (in place of the normal 0·015 gram) in such patients. Finding nothing in their diet to account for this increase, Mayer believed it to be endogenous; he thought it might be due to the fermentative action of the tubercle bacillus, but could find no oxalate production by the growth of tubercle bacilli in sterile serum or blood. But staphylococci and streptococci, such as occur in phthisical cavities in the lungs, did produce measurable amounts of oxalates under these circumstances, derived no doubt from the incomplete oxidation of the sugar in the blood. Hence he argues that the presence of an excess of oxalates in the urine of tuberculous patients suggests suppuration, and is an unfavourable sign prognostically.

It has been shown that the injection of oxalic acid into dogs gives rise to indicanuria. Indicanuria also is commonly observed in phthisical patients who have no diarrhœa, and is taken to indicate the occurrence of suppuration. Mayer finds that marked indicanuria and oxaluria run together in patients with tuberculous cavities or erysipelas or septicæmia; but in cases of early phthisis the urine shows no excess of indican or oxalic acid. He observed oxaluria in cases of septicæmia, erysipelas, and purulent meningitis; it was absent in typhoid fever, measles, diphtheria, and scarlet fever. The oxalate is not as a rule precipitated in the urine of phthisical patients because it contains relatively too much Ca and too little Mg, the Ca-excretion of persons with phthisis being increased.

A. J. JEX-BLAKE.

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Aneurysm of the Hepatic Artery.

BICKHARDT (J.) and SCHÜMANN (E.). *Deutsches Arch. f. klin. Med.*, 1907, 90, p. 288.

BICKHARDT records a case of sudden death due to rupture of an aneurysm of the hepatic artery, and a third case in which he has diagnosed the presence of such an aneurysm intra vitam. The first patient, a small, thin woman of 69, who had often suffered from rheumatism since she was 50, for five months before her death complained of attacks of severe abdominal pain and vomiting; one month before her death she also had hæmatemesis. She had fever with these attacks, which passed off spontaneously in the course of a few days; the epigastrium was tender on pressure, and an epigastric tumour, connected possibly with the liver or the stomach, appeared five months before she died; it grew slowly, and was observed to shrink after an attack of hæmatemesis on one occasion, and a systolic murmur could be heard over it a few days before the patient died. Cystic tumour of the liver was diagnosed; the woman died from asthenia after a bout of severe hæmatemesis and melæna. Schümann found a tumour the size of a goose's egg on the lower and back side of the left lobe of the liver, passing downwards in the expanded hepato-duodenal ligament, and four-fifths of it lay outside the liver. Its upper wall could not be clearly distinguished from the liver-tissue it compressed; it contained blood and clot, and its cavity communicated with the middle third of the hepatic artery by a slit $^3/_5$ inch long and $^1/_{12}$ inch wide, and by an oval perforation $^3/_5 \times \frac{1}{3}$ inch with the duodenum $2\frac{1}{2}$ inches below the pylorus. The liver was fatty and markedly cirrhotic. The aneurysmal wall was full of tuberculous deposits; Schümann supposes that the arterial wall was involved by the spread of tubercle from a tuberculous gland or abscess abutting on it, and diagnoses "aneurysma tuberculosum" or an "arrosion" aneurysm (?erosion aneurysm). The aneurysmal wall contained no elastic fibres and was not covered with intima; Schümann observes that it was not necessarily a false aneurysm.

Bickhardt's second case was that of a well-nourished boy of 10 with early tuberculous hip disease. He was operated upon, and lay in hospital for three months; one evening he suddenly complained of feeling very ill while eating his supper, grew pale, sweated, collapsed, and died in two hours. At the autopsy Schümann found osteomyelitis of the left femur, adherent pleura and pericardium, nephritis, multiple embolic abscesses in the kidneys, and subcutaneous hæmorrhages. The abdomen contained much clotted blood, derived from a rupture three inches long on the convex upper surface of the right lobe of the liver, just in front of the right coronary ligament. The rupture led down into a cavity the size of a hen's egg in the

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middle of the liver tissue. The wall of the cavity was up to $^2/_5$ inch thick, soft, pale, stratified, made up of fibrin and blood corpuscles. The right-hand main branch of the hepatic artery led into this cavity; Schümann supposes that the osteo-myelitis gave rise to a subacute septicæmia, the bacteria passing through the lungs and giving rise to septic thrombosis in the liver and kidneys, and in the liver causing the occurrence of the aneurysmal dilatation described above. The foramen ovale was closed.

Bickhardt has collected 37 cases of hepatic aneurysm. He gives a general discussion of the subject and its literature. Its chief symptoms are—(1) pain, often like that of gall-stone colic; (2) jaundice; (3) hæmorrhage into the gastro-intestinal tract. Swelling of the liver or gall-bladder, pyrexia, and abdominal tumour with a murmur, have been recorded less frequently in these cases. Schümann adds a brief discussion of the pathology of the conditon. References to the literature are given.

A. J. JEX-BLAKE.

Staphylococcal Septicæmia and Pyæmia.

OTTEN (M.). *Deutsches Arch. f. klin. Med.*, 1907, 90, p. 461.

THE author reviews briefly the recent literature of staphylococcal blood-infection, and gives details of 22 further certain cases of the condition treated 1902—1906 in Lenhartz's clinique; in 1903 Lenhartz published 33 cases already observed by himself.

In 5 of these 22 case the staphylococcus pyogenes (aureus or albus) entered the system from a furuncle; 3 recovered, 2 died; in 3 cases (1 fatal) the blood-cultures proved sterile repeatedly; in all a leucocytosis was observed; the staphylococcus was cultivated from the urine once and from the cerebro-spinal fluid twice in these cases intra vitam. In one case (which recovered) a staphylococcal hepatic abscess arose, was diagnosed, was opened up after resection of the 8th rib in the anterior axillary line, and drained; the patient made a good recovery after a second hepatic abscess had been opened and drained through the same incision 9 days later; no other metastasis was observed in this patient.

The hepatic abscesses in staphylococcal pyæmia are generally microscopic in size, and associated with similar abscesses in other organs. Bertelsmann has recorded 10 cases of staphylococcal septicæmia, in which the infection arose through furunculosis; 5 were fatal, and in these 5 the coccus was grown from the blood.

In 6 cases the infection arose through a wound or whitlow; 5 died. Four ran a very acute course (3, 7, 8, and 10 days, respectively); in 4 the bacterium was grown from the blood-

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cultures, in 2 (1 fatal) the blood proved sterile. Otten remarks that the number of metastatic abscesses found varies with the number of bacteria grown in the blood-cultures; in cases where these cultures proved sterile, the staphylococcus has often been found in the urine or in metastatic abscesses; 15—20 c.cm. of blood are taken for the cultures. In 3 of the 11 cases so far dealt with, paranephric abscess was found and treated; the 3 patients recovered, and their blood-cultures were sterile, and Otten gives and discusses the literature of such abscesses. In one case cerebral abscess was found; in another, a staphylococcal abscess in the wall of the small intestine among other places.

In 4 of the 22 cases infection occurred through mucous membranes; 3 were cases of puerperal infection (1 fatal), one of tonsillar (fatal). Puerperal staphylococcæmia is much rarer than puerperal streptococcæmia; in one patient the infection may well have been through the urinary tract rather than the uterus, and Otten notes that in 7 of Lenhartz's 33 recorded cases the infection occurred through the urinary tract after catheterisation or the passage of a bougie. In one puerperal case that recovered, blood-cultures (10—30 c.cm.) were made 6 times; the numbers of colonies of staphylococcus pyogenes albus in pure culture grown were 900, 1,200, 1,020, 6, 360, and 0.

In 6 cases, 4 of them rapidly fatal, the infection followed osteo-myelitis; in all of them the staphylococcus was cultivated from the circulating blood. All were male patients, 5 aged 13—19, one aged 25. In each of the two patients who survived, only a single osteo-myelitis focus was observed.

In one case the source of the infection was not found, either during life or at the obduction. The patient, a boy of 11, died in ten days.

In these 22 cases staphylococcus pyogenes aureus was found 18 times, the albus 4 times; 14 patients died, the staphylococcus having been grown from the blood of 13; and 8, 4 of whom had exhibited staphylococcæmia, recovered. Ulcerative endocarditis occurred thrice, and 11 times in Lenhartz's cases = 25 per cent. of the 55. Reye recorded endocarditis only in 6 out of 149 cases of streptococcæmia.

A. J. Jex-Blake.

The Differentiation of Partial from Total Transverse Lesions of the Spinal Cord.

Thomson (A.). *Edin. Med. Journ.*, 1907, p. 26.

The importance of distinguishing between partial and total destruction of the spinal cord by trauma is evident both in considering prognosis and treatment. In total transverse lesions every function of the cord below the site of injury is immediately and permanently arrested. The paralysed limbs at once become

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flaccid, their muscles waste rapidly and their faradic excitability lessens and may be finally lost; the loss of sensation is complete below the distribution of the corresponding sensory roots while above this level there may be a narrow band of hyperæsthesia; the tendon reflexes, too, are probably invariably lost below the lesion, and finally there is generally paralysis of the vaso-constrictor fibres with dilatation of the cutaneous vessels; in lesions of the higher segments of the cord in young men this may result in priapism. The same conditions may be found in partial lesions during the first few days after the injury, owing to œdema or hæmorrhage temporarily abolishing the conduction of nervous impulses through the injured segments.

The author holds that when the lesion is complete, that is when there is destruction of all fibres of the transverse section of the cord, regeneration of the conducting paths is not possible.

The return of the knee-jerks after an interval is convincing proof that the lesion is a partial one. The return may take place within a few days or may be delayed for a month or more. It is the first sign of recovery, combined with a gradual change of the limbs from the flaccid to the spastic condition.

These arguments are illustrated by two of the author's cases. The first case was of a man who on being thrown from a carriage lost immediately all power of motion and sensation below the third rib. There was also paralysis of the small hand muscles, anæsthesia along the ulnar borders of the upper limbs, palsy of the cervical sympathetic, incontinence of urine and faeces and abolition of all reflexes below the level of the lesion. There was no apparent injury of the vertebral column. Although the symptoms pointed to complete transverse lesion of the spinal cord the knee-jerks were again obtainable within five weeks and there was some return of sensation and of the power of movement. Nine months later the bladder functions were normal and he was able to walk short distances alone. The lesion must have been therefore only partial; it was probably due to hæmorrhage into the cord, while the acuter symptoms which immediately followed the accident were probably due to œdema of the injured segments.

The second case was of a woman who was picked up completely paralysed below the waist after being thrown from a bicycle. Three days later, however, her knee-jerks had returned and limited movement of the toes was possible. Laminectomy was performed three months after the accident at the patient's own wish and a dislocation between the fourth and fifth dorsal vertebræ was found; by this there had evidently been incomplete crushing of the cord. Very little further improvement took place; dribbling incontinence of urine gave way to reflex emptying of the bladder at regular intervals. It is interesting that menstruation stopped for eleven months after the accident, and was thereafter regular for the next two years.

GORDON HOLMES.

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The Diagnosis and Operative Treatment of Spinal Tumours.

SCHULTZE (F.). *Munch. med. Woch.*, 1907, July 9th, p. 1361.

THE case recorded was of a healthy girl 21 years of age who complained of slowly progressive weakness and numbness of the legs, which she first noticed about six months before she came under observation. She never had referred or radiating pains indicating any involvement of the dorsal spine roots. When first seen there was little definite loss of power in the lower limbs, but it increased so rapidly that three months later she was quite unable to stand. There was a considerable degree of sensory loss extending up to the level of the seventh dorsal root area, deficient sphincter control, and exaggerated knee-jerks and ankle clonus. Nothing abnormal was discovered in the upper extremities, and there was no affection of the functions of any of the cranial nerves. On these symptoms the diagnosis of compression of the seventh dorsal segment of the spinal cord was made and laminectomy was advised. An extradural fibroma was removed from this region by operation, and thereafter recovery of function was very rapid; the patient was able to walk alone three weeks later.

Two other cases more recently under the author's observation are referred to. In the one there was slowly progressive paraplegia without any loss of sensation, but with pains in the back although there was no evidence of vertebral disease. Operation failed to reveal any lesion to explain the symptoms, but when the patient died a few months later tubercular spinal disease was discovered. The other case was very similar to that above recorded, and in it too there was at no time any radiating root pains though the compression of the cord was due to an intra-thecal tumour which was successfully removed by operation.

The author's expressed purpose in recording these cases is to insist that in many cases of compression paraplegia, especially in those cases due to non-malignant tumours, referred root pains may be absent during the whole course of the illness.

GORDON HOLMES.

Manganese Poisoning and Manganese phobia.

JAKSCH (V.). *Munch. med. Woch.*, May 14, 1907, pp. 967—72.

VON JAKSCH describes 3 cases of a peculiar nervous affection in workers in the Manganese industry which he considers to be due to the inhalation of dust laden with particles of manganese monoxide. He suggests that an albuminate of manganese is produced and carried to the nervous system as in the case of mercury and lead.

Cooper in 1837 described 5 cases with paraplegia, muscular weakness and trembling of lower limbs, lisping speech, alterations in field of vision and salivation. In v. Jaksch's cases there

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were psychical and emotional disturbances, monotonous scanning speech, retropulsion, increased patellar reflex, no Babinsky's reflex, no nystagmus and no alteration in field of vision; in one only was there glycosuria. The prognosis is favourable as far as life is concerned though some symptoms remain stationary whilst severe nervous symptoms may disappear.

It seems also that amongst the workers there is a neurosis simulating this disease which may be called manganesephobia. The article is illustrated by photographs.

J. M. BERNSTEIN.

The Action of Nicotine on the Circulation.

GRASSMAN. *Munch. med. Woch.*, May, 1907, pp. 975—8.

GRASSMAN, criticising the experimental work and clinical opinions concerning nicotine and its action on the circulation, expresses a view that nicotine is not as harmful as supposed. Owing to the fact that it is usually combined with tea, coffee and alcohol, which themselves act in the circulatory system, it is extremely difficult to isolate the results of its individual action.

J. M. BERNSTEIN.

Tactile Amnesia.

BURR (CHARLES W.). *American Journ. of the Med. Sciences*, 1907.

THIS conditon is to be distinguished from astereognosis, which depends upon definite sensory defect, such as failure to recognise the position of the fingers, to differentiate weight, to locate the point touched and to recognise the number of points of contact, with or without loss of tactile sensation. In tactile amnesia, on the other hand, the failure is in the memory of previous tactile impressions, which should enable the patient to recognise the nature of the article touched. The centre for this mental process is not definitely known, but it probably lies either in the posterior part of the parietal lobe or in the anterior part of the convex surface of the occipital lobe. The frequency with which the symptom is associated with word blindness and mind blindness makes it probable that the centre is near the higher visual centre. Tactile sensation is not affected, and therefore the centre for common sensation cannot be involved. The writer has never met with tactile amnesia in cases of pure motor aphasia or uncomplicated left-sided hemiplegia, nor in right-sided hemiplegia unless there was also a greater or less degree of word blindness or object blindness or some type of sensory aphasia. It is frequently seen in cases of pure mind blindness and in mind blindness occurring as an early symptom of dementia caused by diffuse organic brain disease. There may, however, be complete

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mind blindness, or inability to recognise objects by sight, without any tactile amnesia. The writer has never seen it as an isolated symptom.

Seven cases are reported, but in only one of these was there a post-mortem examination. In this case, a large tumour was found infiltrating the whole left parietal lobe and the anterior part of the occipital lobe. It did not pass the fissure of Rolando anteriorly. The cerebral arteries were all markedly sclerosed, and many small areas of softening were present in both hemispheres. The lesions were thus so widespread that the case could not be used for the purpose of localisation.

J. W. RUSSELL.

Difficulties in the Diagnosis of Brain Abscess.

POTTS (BARTON H.). *Amer. Journ. of the Med. Sciences,* 1907.

THE cardinal symptoms of cerebral abscess are neuro-retinitis or choked disc, subnormal temperature, headache, chills, vomiting, slow pulse and cerebration, stupor, high leucocyte count with high percentage of polymorphonuclear cells, and absence of pus from the cerebro-spinal fluid. But these symptoms frequently fail: the fundus changes are often of late appearance, and the temperature may not fall below 101° or the pulse below 80. Cerebellar abscess often gives no characteristic symptoms, but sudden attacks of extreme vertigo, roaring in the head, relaxation of limbs with fall and loss of consciousness (Dana's cerebellar seizure) are very suggestive, when met with. According to Sachs, the early development of reaction of degeneration in the facial nerve points to the existence of an abscess in one of the lateral lobes of the cerebellum.

Abscess of the frontal lobe usually presents no localising symptoms, unless it is situated about the base of the third frontal or ascending frontal convolution. If the abscess is large, the pupil of the same side is usually dilated; if small, the pupil may be sluggish and contracted. A small abscess in the temporo-sphenoidal lobe is again generally without localising symptoms; but when large, it may give rise to hemiplegia on the opposite side, facial paralysis of the cortical type, or aphasia. Paralysis of the third nerve is sometimes seen with a large temporo-sphenoidal abscess. Reliance in diagnosis must never be placed on the absence of any of these symptoms, and three cases are reported in which temporo-sphenoidal abscess existed without producing any aphasia. The author lays stress on the positive value of leucocytosis with a polymorphonuclear percentage above 80, in the diagnosis of sepsis (of course not necessarily cerebral) and thinks that, with symptoms pointing to infection, its presence may be taken as a deciding factor. Its absence, however, does not contra-indicate sepsis.

J. W. RUSSELL.

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Surgery.

Tuberculous Disease of the Spine in Children.

ELGOOD (OLIVE). *British Journ. of Children's Diseases*, June, 1907. (Abstract of Thesis accepted for the degree of M.S. (Lond.), 1906.)

THE pathological types of tuberculous diseases of vertebræ are—(*a*) localised soft caseous deposits, or sequestra, in the interior of the bone; (*b*) primary superficial caries. The former is the type met with commonly in children, and is associated with localised pus formation, pointing over the seat of disease. It may lead to secondary spreading superficial caries. The latter is typical of adult life, and is associated with the characteristic referred abscess usually connected with spinal disease. The situation of the lesion is by far most commonly the body of the vertebra, but may rarely be found in the spine or transverse process.

Etiology. The disease is commoner and of graver import in the male than the female; and its onset is less frequently associated with injury than in the case of tubercular lesions of joints. Taken analogously with the well-known tendency of the male child to contract acute infective osteomyelitis upon exceedingly slight local trauma, it may be argued that the resistive power of the blood to bacterial invasions of bone is greater in the female than in the male. The examination of the opsonic indices for the tubercle bacillus made in cases of boys and girls respectively bore testimony to this hypothesis.

Clinical Signs and Diagnosis. A classification of all cases of spinal caries may be made according to clinical signs as follows:—

I. Early cases before the establishment of curvature. The cardinal feature and main diagnostic point of these cases is rigidity. Differentially they are to be diagnosed from (*a*) rickets in infants; (*b*) hysteria in older children and adults.

II. Cases with spinal deformity, but without complication.

III. Cases with or without deformity, but with complication—(*a*) abscess; (*b*) some concomitant tuberculous trouble: (1) phthisis, (2) adenitis, (3) joint and bone affection; (*c*) sepsis; (*d*) compression of the spinal cord.

Treatment may be considered upon the following lines:—

1. By conservative methods, briefly amounting to "rest"—(*a*) complete rest in bed, (*b*) plaster jackets, (*c*) splints of various forms.

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2. Operative procedures—(*a*) partial, dealing merely with the presence of pus; (*b*) radical, dealing with removal of the diseased area through the medium of laminectomy.

3. Vaccine treatment.

The last method is of value in carefully selected cases, its use being an adjunct to other forms of treatment, in every case rest being strictly insisted upon.

In cases of existing sinuses, which are submitted to vaccine treatment, local curetting and the removal of sequestra should be combined with the injections, and in cases of mixed infections cultures should be grown from the discharge and, after sterilisation, should be injected along with the tuberculin.

With regard to the value of modifying the injections according to the chart of opsonic indices, it has been found in the cases upon which this paper was based that it is more valuable to use the local signs as indicators for re-injection.

AUTHOR'S ABSTRACT.

A Case of Chronic Otitis Media, Hæmorrhage into the External Auditory Canal, Perforation of the Wall of the Pharynx, with Fatal Hæmorrhage from the Jugular Vein.

JACK (F. L.) and VERHOEFF (F. H.). *Boston Med. and Surg. Journal,* Vol. clvii., No. 1.

A CHILD, æt. $2^1/_2$ years, admitted to hospital with the history of having been ill for about two weeks; a discharge of pus had been noticed from the right ear for several days and a post-aural swelling for a week. On examination the right meatus was found filled with coagulated blood and a swelling the size of a tangerine orange extended below and behind from over the mastoid tip. Two hours after admission the child was seized with severe hæmorrhage from the mouth which was quickly fatal. Autopsy showed both nostrils and right external auditory meatus filled with blood clot; meninges and brain normal; venous sinuses free including right lateral sinus and bulb; the soft tissues beneath the temporal bone are the seat of a large hæmorrhagic extravasation which communicates with the pharynx just below the Eustachian tube, extends outwards to the angle of the jaw and communicates with the external auditory canal; tympanic membrane intact but cicatricial, tympanic cavity, attic and antrum full of exudate but containing no blood; no necrotic bone found.

Histological examination showed the evidence of chronic suppurative otitis media; the medullary spaces of the surrounding bone are here and there the seat of small pus foci; the soft tisues about the seat of the hæmorrhage are involved in a formation of granulation tissue, in which are large areas of pus cells; the wall of the jugular vein is here completely necrotic,

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lined with purulent thrombi and in places perforated. Bacteriological examination proved presence of streptococci but of no other organisms.

The march of events was chronic suppurative otitis media, abscess beneath the temporal bone due to streptococcus pyogenes, perforation of internal jugular, infected hæmatoma; hæmorrhage into the external auditory meatus; perforation of wall of pharynx and fatal hæmorrhage from the internal jugular vein.

LINDLEY SEWELL.

Case of Perforation of Jejunal Ulcer Seven Years after Gastro-Jejunostomy.

EDINGTON (GEO. H.). *Glasgow Med. Journal,* June, 1907.

THE patient's history was as follows:—

In September, 1899, an anterior gastro-jejunostomy was done for pyloric stenosis. After this he was quite well until 1904, when a cholecystostomy had to be performed for gall-stones. After this he was quite well until November 9th, 1906, when he was admitted to hospital with symptoms of perforated gastric ulcer. A laparotomy was performed through the old scar, when fluid and gas were found issuing from a rounded, punched-out opening, a quarter of an inch in diameter, on the anterior surface of the jejunum to the left of the gastro-jejunal anastomosis. The perforation was closed with sutures and the abdomen cleansed by irrigation, but the patient never rallied and died three hours later of general peritonitis.

The author draws attention to the following points of interest obtained from the operation and post-mortem examination:—

1. The gastro-enterostomy was an anterior one, and had been performed for non-malignant obstruction.
2. The anastomosis was near the pyloric end of the stomach.
3. The bowel had been fixed with its peristaltic current, opposed to that of the stomach.
4. The ulcer in the jejunum was to the distal end of the artificial stoma, in a part of the gut which would probably not be bathed by the bile and pancreatic juice before the stomach contents came in contact with it.
5. While the proximal limb of the jejunal loop was observed to be taut at the time of the operation the distal portion was slack.
6. Absence of warning symptoms.

The author gives a survey of the literature on the subject. So far thirty-one cases of jejunal ulcer perforating after gastro-jejunostomy have been recorded, and Gossett classifies the cases into three groups:—

1. Those with sudden onset causing general peritonitis.
2. Adhesions, localised peritonitis with pseudo-tumour.
3. Forming an adhesion with the transverse colon. Gosset's

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own case belonged to this last group, in all of which a posterior gastro-enterostomy had been performed.

The author holds with Gosset that anastomosis should be made with the fundus of the stomach and not in the vicinity of the pylorus where hyperacidity of the gastric juice is at a maximum. That the ulcer was caused by the contact of stomach contents with the bowel wall is shown in the present case by its situation at the point of anastomosis. P. R. WRIGLEY.

Some Rare Forms of Hernia.

VAUGHAN (G. TULLY). *New York Med. Journ.*, 1907.

UNDER this heading the writer discusses retro-peritoneal, pro-peritoneal, interstitial and superficial herniæ :—

1. Retro-peritoneal hernia occurs at the foramen of Winslow, duodenal fossæ, peri-cæcal fossæ and the sub-sigmoid fossa.

2. Pro-peritoneal hernia pushes its way between the peritoneum and the transversalis fascia.

3. Interstitial hernia is caused by the hernia passing between the abdominal muscles, either between the internal and external oblique muscles or between the external oblique and the transversalis fascia, pushing aside the internal oblique and transversalis muscles.

4. Superficial hernia is that form of inguinal hernia where the hernia exists between the outer surface of the external oblique and the superficial fascia.

The last three varieties should all be included under the name interstitial. Taking this classification, an interstitial hernia usually occurs with an inguinal, femoral or umbilical hernia, for example, as a result of taxis, or the cause may be obstruction of the inguinal canal, as from an undescended testicle, so that the hernia, not being able to pass completely through the inguinal canal, makes its way between muscles or muscle and fascia.

He concludes by reporting an interesting case operated on under the impression that it was a direct strangulated inguinal hernia, but which the operation showed to be a hernia which had evidently begun as a protrusion of peritoneum deep down in front of the left side of the bladder in the trough between the plica urachi and plica hypogastrica, the sac increasing in size between the peritoneum and obturator foramen, passed up behind it and the crest of the pubes, to project finally through the external abdominal ring. P. R. WRIGLEY.

Some Clinical Observations on Stenosis of the Larynx.

MOURE (E. T.). *Journ. de Méd. de Bordeaux*, July 21st, 1907.

THE writer points out that laryngeal stenosis is very prone to result from opening of the crico-thyroid space in infants and

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adolescents if the tube is retained some little time. This is due partly to the chronic inflammatory tumefaction from the presence of a foreign body so close to the glottis and partly to the fixation of the arytenoids which results from the two halves of the cricoid being widely separated by the tube, it being almost impossible to introduce the tube without cutting through the cricoid ring and so permitting this separation. This resulting stenosis provides the explanation of the laryngeal spasms which frequently occur on removal of the tracheotomy tube.

For this condition perform a lower tracheotomy when the inflammatory œdema will gradually subside; intubation or dilatation from above only irritates the part and produces further trouble. Inter-crico-thyroid tracheotomy is a bad operation and should only be made use of in urgent cases.

More serious laryngeal stenosis results from the healing of ulcers which gives rise to either narrow membranous bridges or to circular contractions. The former are satisfactorily treated by division with the galvano-cautery and subsequent dilatation with Schrötter's tubes; the latter are much more difficult and the best results are obtained from a " laryngostomy," which consists in making a median vertical incision through the cricoid or thyroid or both according to the extent of the narrowing, reaching below to the tracheotomy tube. The thyroid and cricoid are sutured on either side to the skin, the cicatricial tissue in the interior of the larynx resected, and a rubber drainage tube inserted, outside which are put layers of gauze to keep the wound open. The wound is dressed daily, the size of the rubber drain being gradually increased so as to produce sloughing of the cicatricial tissue, and so create a laryngo-tracheal channel which is to become covered by epithelium continuous with that of the skin. When the passage is judged large enough the two halves of the thyroid are allowed to come together again, a little later the cricoid also, a rubber tube being introduced into the new air way for a little time. The tracheotomy tube is now removed and a little later the rubber tube, and if the air passage appears quite free the remaining wound then allowed to close.

LINDLEY SEWELL.

The Treatment of Congenital Dislocation of the Hip by the Abbreviated Orthopedic Method.

JUDET (H.). *Le Progrès Méd.*, July 20, 1907.

THE original method of Lorenz involved the application of three successive plaster-cases corresponding to the three positions after reduction, the total duration being from eight to ten months. The short method is derived directly from that of Lorenz and

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in the writer's opinion constitutes a considerable advance upon the latter. It consists in the application of one or at the most of two plasters, the duration in either case not exceeding five months. He describes in detail the method of reduction in simple and in difficult cases which, however, is practically identical with that in use by surgeons who practise Lorenz's methods. He points out that, even if it prove impossible to actually replace the head in the acetabulum, the case need not be regarded as a failure, since a low and fixed anterior position is substituted for the high and mobile posterior luxation, and the child's walk will be considerably improved. The important point for the success of the short method lies in the position of the thigh during the application of the plaster: it must be in advance of the frontal plane of the body so that a cushion 6 to 8 inches thick may be interposed between the thigh and the horizontal plane on which the child lies, corresponding to an angle of 40° to 50°. This position must be rigorously maintained throughout the application either by the help of two assistants or by the special pelvic support. The plaster case is worn for $4^1/_2$ to 5 months. On its removal the limb is allowed to return to the straight position of its own accord which takes 3 to 6 weeks during which the thigh is massaged. When the limb has returned to the vertical the walking exercises are commenced.

This method is particularly successful in children of three to six in whom reduction has been effected without rupturing the adductors. When the adductors have had to be ruptured and the limb put up in complete abduction, *i.e.*, with the thigh flat on the table, it is better to apply a second case at the end of three months, with the limb brought down to the second position and preferably taking in the foot. This is retained for two months during which the child is able to stand and even to walk a little.

After-treatment consists in re-educating the child to walk, and in daily massage, along with friction, brine baths and perhaps electricity; and the rapidity of the cure depends much upon the thoroughness of these measures. The results as to walking—in favourable cases the gait in 3 or 4 months may be irreproachable, but in older children it may take from 5 to 8 months to attain this result.

As regards age, the most favourable is from three to six; before $2^1/_2$ years reduction is easy but soiling by the excretions makes the plaster badly borne. Reduction though possible even up to 12 years is generally laborious after 6 or 7; where shortening is considerable (an inch and a half or more) preliminary extension by a weight of six to eight pounds for one to three weeks facilitates reduction of the head.

G. R. Mill.

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Large Tumour of the Laryngo-pharynx Removed by Subhyoid Pharyngotomy.

CHAPPELL (W. F.). *Medical Record,* July 13, 1907, p. 55.

THE patient was a woman aged 51, who had had a cough since the age of 18, and some hoarseness since the 36th year. For six years she had been dyspnœic and had been treated for asthma; during the last two years she had choked during meals, and sometimes vomited. The laryngoscope revealed a large mass of grayish-blue colour completely filling the laryngo-pharynx and covered with tortuous vessels apparently springing from a pedicle on the left side. No part of the larynx was visible. A low tracheotomy was performed to do away with the immediate risk of complete obstruction, and eight days later an attempt was made under cocaine to engage the growth in the loop of a cold wire snare, but the extent of the growth down the œsophagus and its many adhesions rendered this impossible. A week later a subhyoid pharyngotomy was performed, and the pedicle, which was close to the left aryteno epiglottic fold, was ligated with silk; the growth was found to be encapsuled, and was shelled out, the capsule being then cut away down to the ligature. The wound was sutured in layers. The tumour was smooth, irregular in shape, with a circumference of $4\frac{1}{2}$ inches, weighing 20 grams. It was composed of fibrous tissue. Convalescence was quite uneventful, excepting when feeding by the mouth was commenced, some of the food finding its way into the larynx and infecting the wound.

The operator thinks that the tumour dated from girlhood; he has collected reports on eleven similar cases from the literature; one ended fatally after a subhyoid pharyngotomy, two survived a lateral external operation, and in the remainder the intra-laryngeal operation was possible.

LAWRENCE JONES.

Transvesical Enucleation of Prostate.

QUERVAIN (F. de). *Revue Médicale de la Suisse Romande,* July 20, 1907, p. 513.

EXAMPLES of simple prostatic hypertrophy fall naturally into two classes. Those with diffuse enlargement but with a normal relation to the capsule and those made up of many nodules each surrounded by its special capsule and giving rise to a more irregular form of hypertrophy.

The author points out that the line of separation in the former

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is between the prostatic substance and the capsule, in the latter between the spurious capsule of the nodules and the atrophied prostatic tissue. He follows Freyer very closely in his method of operation, and thinks it is useless and even harmful to attempt to save the prostatic urethra.

The operation is easy in the case of a soft nodular prostate, more difficult with the smaller fibrous type and still more so with malignant disease, although even in the last the ultimate results are excellent. Hæmorrhage is usually only a temporary trouble, and if it refuses to cease spontaneously it can be checked by tampons soaked in hæmostatic gelatine; it is a much more serious affair in malignant disease for the prostatic plexus rarely escapes. As to drainage, authorities differ, some being in favour of simple suprapubic drainage, others of suture of the bladder and the tied-in catheter, others of suprapubic and ureteric syphonage combined.

In aseptic cases the author thinks that suture is permissible provided the patency of the catheter is assured by frequent injections of sterile water. Otherwise he is in favour of the combined method, omitting both tubes in 8—15 days' time. A certain amount of incontinence for a short time is a common event.

If the operation has been properly performed the vesiculæ seminales and ejaculatory ducts are not harmed. As to the question of regeneration of the prostate, this is impossible in the diffuse cases, in which the whole prostate is removed once and for all, but in the nodular variety where a certain amount of compressed prostatic tissue is left behind there is quite a possibility, as the author has proved, that the prostate will in part reform.

The mortality of the operation is not great enough to prevent its frequent performance, and although he considers that the 3 per cent. mortality of Freyer has not been attained by other surgeons, yet he allows that deaths are usually due to some coincident affection or some direct complication. As to the final result there can be no doubt; in all the author's cases micturition became perfectly normal. There may be a slight degree of incontinence for a time, but this disappears as the muscles of the membranous urethra take on the function of a vesical sphincter; in two of his patients, both of whom suffered from considerable overdistension of the bladder prior to operation, there is a gradually diminishing amount of residual urine. He does not agree with Rovsing that total removal of the prostate produces ill-effects on the mental condition, but rather the reverse. It is not possible to make a diagnosis of malignant disease with any certainty; the actual signs will not tell one, and the history alone will suggest its presence.

LAWRENCE JONES.

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Stiffness following Apparent Contusions of the Elbow.

McWILLIAMS (C. A.). *Medical Record,* May 25th, 1907, p. 853.

THE author has frequently been puzzled by the limitation of movement which may follow injuries of the elbow shown clinically and by the X-rays to be simple contusions without fracture. Such joints if subsequently photographed may show definite small shadows of apparently detached bone.

The origin of these loose fragments is periosteal, the injury having caused a tear of the periosteum without fracture.

LAWRENCE JONES.

A Method of Reducing old Colles' Fractures.

McWILLIAMS (C. A.). *Medical Record,* May 25th, 1907, p. 853.

THE method is as follows:—A large engineer's monkey wrench is used, the blades being well padded.

Under an anæsthetic the blades are placed so as to cross the radius, in the line and situation of the old fracture; after screwing up the blades the bones can be refractured by the use of very little force; the after treatment is similar to that suitable for a recent fracture.

By this method the author claims that an open operation is avoided and a minimum amount of damage is done to the soft parts.

LAWRENCE JONES.

Submaxillary Calculus.

SCHWARTZ (E.). *Gazette des Hôpitaux,* June, 1907, No. 66, p. 783.

A WOMAN, aged 43, had noticed for 10 years that a swelling formed from time to time in the left submaxillary region, during meals; this swelling had been painless at first.

Five years ago the symptoms became more intense and there was also severe radiating pain for which she consulted the author who diagnosed submaxillary calculi; however the symptoms again decreased until November, 1906, when pain in the throat and floor of the mouth associated with dysphagia, appeared. She said that pus had been discharged into the mouth, and that this had been followed by a decrease in the symptoms; although, when seen, there was no sign of suppuration and the duct, though inflamed, was not discharging pus.

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The gland was removed through a concave, external incision; it was found to be much enlarged, sclerosed and containing small abscess cavities and two calculi, the largest, the size of a nut.

He considers this to be the correct treatment of calculi if they are deeply placed or if there is much alteration in the gland itself. The operation is an easy one, and the scar is well hidden by the lower jaw.

LAWRENCE JONES.

Etiology and Diagnosis of Spermatocele.

WHITNEY (C. M.). *American Journ. of Urology*, May, 1907. Vol. iii., No. 5, p. 175.

THE author emphasises the fact that these swellings may reach a size equal to that of a true hydrocele. There are six theories as to the origin of these cysts:—

1. That they develope from the remains of the Wolffian tubules around the epididymis.

2. That they are retention cysts of the seminiferous tubules, a condition often seen in the testes of elderly men and due to the natural fibrosis of that period.

3. That they are due to overlapping of the serous layers at the junction of testis and epididymis.

4. That they are caused by injury.

5. That they are the result of ungratified sexual desire.

6. That they are lymphatic in origin.

The first four of these theories are accepted as being possible explanations. As shown by a case reported in this article, such cysts may be translucent; the fluid withdrawn is nearly always milky, often opalescent and separates, on standing, into two layers, the lower one of which contains spermatozoa. Contrasted with ordinary hydrocele fluid the specific gravity is low and there is but little albumin. These cysts are most commonly found between the 40th and 50th year; they are usually small, situated above and behind the testis.

The diagnosis, prior to tapping, is not easy; the smaller ones may be confounded with small inflammatory indurations, the larger ones with hydrocele, hæmatocele and solid tumours of the testis. Curiously, the prognosis after treatment, short of radical operation is better in these cases than in hydrocele; in fact, the author recommends the method of tapping and injection.

LAWRENCE JONES.

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Abdominal Tumours associated with Disease of the Testicle.

OSLER (W.). *Lancet,* May 25, 1907, p. 1,409.

DR. OSLER points out the importance of examining the testicle in obscure cases of abdominal disease, and in support of this brings forward the following example:—

A man of 22, when seven years old, fell and injured his testis, which has been a little enlarged ever since; six months ago it began to increase in size more rapidly, and six weeks ago he noticed some abdominal swelling. The left testis is about the size of a small orange, smooth and firm, with obvious glandular swellings in both groins; associated with this tumour there is always a large fixed intra-abdominal mass.

The case illustrates the relation of trauma to malignant disease, and in one other case the author observed sarcoma to follow an injury so rapidly as to simulate orchitis. Since the testicular lymphatic vessels pass into glands situated very far up the aorta the secondary abdominal tumour is generally in the upper part of the abdomen. The notes are also given of three very interesting cases of malignant disease of a retained testis, in two of which ascites was a prominent feature, recalling its frequent association with solid tumours of the ovary.

LAWRENCE JONES.

Total Extirpation of Pancreatic Cysts.

GÖBELL (R.). *Arch. für klin. Chirurg.,* Band 83, Heft 3, p. 784.

CONSIDERING that the final results of Gussenbauer's method of treatment by suture, incision and drainage were not so good as immediate statistics would lead one to expect, Helferich in 1901 attempted the complete removal of a pancreatic cyst, which was found to consist of two loculi, one of which could be removed but the second one owing to its situation could only be drained; however, a cure resulted.

More recent work has shown that the traumatic pancreatic cysts and the majority of other cysts have an inflammatory origin and therefore are not suitable for extirpation but can be treated by incision and drainage. The former method is indicated only if the cause is neither inflammatory nor traumatic and if the cyst is not too adherent or has a definite pedicle.

In August, 1906, a man, aged 23, was seen with a pancreatic cyst almost filling the abdomen, so large as to be mistaken for ascites, and tapped, the fluid showing the correct diagnosis; beyond the mechanical effects of so large a cyst there had been no symptoms.

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At the operation, the incision made was large and placed parallel to the left rib margin, the cyst presented and was partly emptied by a trochar. Its wall could then be drawn through the hinder part of the incision, extra peritoneally; the lining of the cyst was smooth and like mucous membrane, in one place shot with many colours. Complete separation was finally effected with difficulty, some damage to the pancreas being unavoidable.

Above the cyst was the stomach, below the lower pole of the kidney, to the left the spleen,and to the right the transverse and descending mesocolon. The pancreas was plugged and the wound drained. The wall of the cyst was found to be made of fibrous tissue, nowhere was epithelium to be seen.

It therefore appears to have been a pseudo cyst of peritoneal origin; and although many authorities think that the epithelium of a true cyst may vanish through the digestive action of the contents; this seems disproved by the existence of undigested fibrin in the walls.

The contents of the cyst were sterile.

Out of 7 other cases of pancreatic cyst, in 5 there were appearances pointing to an inflammatory origin. Honigmann has collected 76 cases of pancreatic cyst having a traumatic origin out of a total of 232.

True pancreatic cysts appear to of great variety. Lazarus reported 21 cases of proliferation cysts in 1904 but Edling on critical examination reduced the number to 11.

Total extirpation of the cyst should only be attempted.

1. If it is certain that it is a proliferating cystoma or a true pancreatic cyst.

2. If extirpation is likely to be easy as when the cyst is situated in the tail of the pancreas.

3. If a fistula refuses to close after incision and drainage.

LAWRENCE JONES.

Inoperable Sarcoma: A further Report of Cases Successfully Treated with Mixed Toxins of Erysipelas and Bacillus Prodigiosus.

COLEY (W. B.). *Medical Record*, July 27, 1907, p. 129.

THE author states that recent work tends to show the importance of the prodigiosus toxins, and in the case of dogs this toxin alone is able to work the cure of sarcomata, although the mixed toxins are more potent. Tracy's experiments support the view that the action of the toxins is by leucocytosis, with coagulation necrosis of the tumour.

Tracy uses a preparation standardised as follows:—

Streptococcus culture in broth (3 weeks growth) ... 100 c.c.

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Prodigiosus suspension (containing 750 milligrams of prodigiosus proteid) ... ... 30 c.c.
Glycerine ... ... 20 c.c.

It is important to begin with a very small dose, not more than ¼ minim, and gradually increasing until a definite reaction with a temperature of 103° to 105° is obtained. The frequency of the injections must vary; some patients can tolerate daily doses.

The author quite agrees with the scepticism shown by the profession with regard to new cures for cancer, but he pleads for his method that it has had 15 years' trial and has produced undoubted cures.

The author would not limit the use of the toxins to the treatment of inoperable sarcoma, but suggests ethat they are of extreme use in preventing recurrence after operation and in treating sarcomata of the long bones as a milder measure than amputation. He knows of 12 cases of sarcoma of the long bones treated by this method, which did not come to amputation, eight of which are alive and well from three to eight years after. Included in the article are the reports of successful cases, some of which have not been published before; altogether Dr. Coley has had 36 cures in his own practice, and knows of nearly 100 more in the practice of others.

LAWRENCE JONES.

The Surgery of the Pericardium.

GLUCK. *Arch. für klin. Chirurg.*, Band 83, Heft 3.

IN June, 1898, Gluck published the report on a patient on whom he had operated 3 years before for a series of tubercular foci in the sternum; these healed but then there formed a large abscess over the sternum so that he was led to resect that bone with the costal cartilages. tying the internal mammary vessels and scraping the infected pericardium; portions of which he actually removed, so that the heart lay exposed over an area equal in size to the palm of a hand. The pleura was not touched for it had retracted.

The patient died one and a half years later.

He incidentally mentions an example of bullet wound of the heart with hæmo-pericardium on which he has more recently operated.

In all such cases he urges the necessity for a very complete exposure of the heart and pericardium, an exposure only to be obtained by using a flap of muscle and bone.

Kocher states that the pericardium is most easily reached at the point where the 6th costal cartilage reaches the sternum.

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The heart is so fixed that effusions change its position but slightly.

He mentions the case of a boy with suppurative pericarditis in whom he resected the 5th rib from the mammary line, inwards for 4 cm. and who improved for some time, to die of septicæmia.

Since then he has operated in a somewhat similar way on a patient aged 56 who has made a good recovery.

Particularly marked in this case were the reflex cough, the dysphagia and the portal obstruction.

In both cases, in spite of the size of the exudate friction sounds over the heart were well marked. In the latter case, a flap was turned back and the 5th rib resected without damaging the pleura the pericardium was opened, and the finger insinuated between the heart edge and the pericardium. For some time after the operation, there was " delirium cordis."

LAWRENCE JONES.

Delayed Poisoning by Anæsthetics.

GUTHRIE (L. G.). *Clinical Journal*, June 12, 1907.

IN this paper Guthrie reviews our present knowledge of this fascinating subject. The paper is in itself an abstract of the more important publications of recent years on the subject, and the reader will find in it a statement of all the factors which, as far as we know at present, have any bearing on this difficult problem. From his review of the subject Guthrie concludes:—

We have seen first that the symptoms of so-called delayed poisoning by chloroform, ether and ethyl chloride are those of acute fatty acid intoxication. Practically in all the fatal cases the post-mortem examination reveals extensive fatty changes in the liver, fatty and necrotic changes in the kidneys and sometimes in the heart. The fatty acids which produce the symptoms, namely, β-oxybutric and diacetic acid, which are the highly poisonous precursors of acetone, are themselves the result of insufficient oxidation or imperfect metabolism of fat. Fat in excess must be present somewhere in order to give rise, by its imperfect metabolism, to fatty acid intoxication. The liver being the chief seat of metabolism of fat, must naturally be the chief organ suspected. All, or nearly all, the diseases and conditions under which operations followed by fatal symptoms of acid poisoning have been performed are those which are known to be associated with fatty liver. These diseases are sepsis, acute and chronic, and diabetes; rickets and infantile paralysis which have been treated by over-fattening and under-exercise; also, probably, conditons such as alcoholism, and certainly starvation.

The practical conclusions offered are: (1) Operations should be delayed when possible if a fatty liver be suspected. It may

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be suspected in subjects of rickets and infantile paralysis who have been overfed with fattening food and under-exercised; in cases of sepsis and diabetes, and when a history of cyclical vomiting is obtained. (2) When a child has recently vomited apparently without cause, an intended operation should be postponed. This precaution has been neglected in many fatal cases recorded. (3) When fatty liver is suspected the patient should be kept for some days on a diet restricted in fats. (4) Bicarbonate or citrate of soda should be given meanwhile in order to neutralise fatty acids which may be present. Mild purgation may be beneficial. (5) Starvation will give rise to acute acetonuria, therefore nutrient enemata should be given two hours before and immediately after an operation. (6) Although any general anæsthetic may be dangerous in the presence of a fatty liver, chloroform is most dangerous of all on account of its specific action on the liver and kidneys.

The treatment of acid intoxication following operations should be by venesection, saline transfusion, and by clysters of solution of bicarbonate of sodium. E. D. TELFORD.

Traumatism and Appendicitis.

JEANBRAN (E.) and ANGLADA (J.). *Revue de Chirurgie,* July, 1907.

NEITHER a blow on the abdomen nor a violent muscular effort is capable of producing appendicitis in any individual whose appendix is in a healthy condition before the accident. The writers have not found a single reported case in which it is proved that trauma determined an attack of appendicitis in a previously healthy organ.

If the appendix is already diseased the case then stands in a very different footing. In any person who has had attacks of acute appendicitis or in any patient who has the signs of chronic appendicitis a blow on the abdomen, even if in a district remote from the right iliac fossa, may light up a pre-existing disease and lead to perforation of the appendix. Trauma acting on a patient with a pathological appendix may lead to the most serious results by causing protective adhesions to give way or by leading to an actual perforation in cases where a spontaneous perforation is imminent. The maximum interval which should be allowed in estimating the traumatic origin of a case is forty-eight hours. If there is a complete absence of symptoms for this length of time after the injury the trauma should not be held responsible for the attack. If the patient recover from the attack which has been lighted up by injury and subsequently had other attacks such subsequent attacks are not to be attributed to the trauma but are to be regarded as relapses of a disease already present at the time of the injury. E. D. TELFORD.

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Congenital Talipes Equinovarus.

CODET-BOISSE. *Journ. de Méd. de Bordeaux*, April, 1907.

IT is agreed that mechanical treatment is sufficient to secure a good result in the earlier stages of this deformity, but when the deformity is of older standing with fixation of the bones of the foot in abnormal relationships the practice of surgeons exhibits very wide differences. The author favours the open operation with free removal of bone, maintaining that the removal of bone does not in any way damage the foot either from an æsthetic or functional point of view, whilst under proper surroundings the danger of infection is nil. The method employed by Codet-Boisse is to remove the astragalus and to excise a wedge-shaped portion of bone from the anterior portion of the os calcis and the adjacent cuboid. The bony surfaces are held in position by a catgut suture. The wound is closed without drainage, and the foot is fixed in plaster with a window at the site of the wound. The patient is allowed to walk on the fifth day. After removal of the sutures a complete casing of plaster is applied from the knee to the roots of the toes. The sole of this plaster is thickened along the outer border to assist in the correction of the foot. The plaster is removed in four weeks, the leg massaged and moved and a fresh plaster applied. This plaster remains for 6—8 weeks. During the treatment the patient is allowed to walk. The results claimed, which are illustrated by photographs, appear excellent.

E. D. TELFORD.

The so-called Syphilitic Stricture of the Rectum.

SCHWARTZE (ED.). *La Presse Médicale*, June 12, 1907.

THE simple cicatricial strictures of the rectum present many points of difficulty. Their etiology is unknown in spite of much work and observation on the subject. These strictures are found most commonly in women, but it is likely that they occur in men with a frequency greater than has usually been supposed. In a large series of cases the proportion between the sexes will be found to work out at one case in the male and four in the female.

Very different are the views held on their origin. At one time they were regarded as invariably syphilitic in origin. It is now certain that this statement is far too absolute as a definite history of syphilis is by no means obtainable in many of the cases. Other writers have suggested their tuberculous or dysenteric origin. It is more reasonable to regard these strictures as secondary to a condition of proctitis. The causes

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of such proctitis are obscure and the same cause will probably not be found in all cases of the disease. The stricture is usually situated within 3–4 cm. of the anal orifice and is usually well defined and of no great vertical extent. Very often the constriction is a simple ring, but in rarer cases it may be more elongated and extensive, even reaching the lower half of the sigmoid colon. There are always present above the stricture a definite area of ulceration, and in some instances this ulceration leads to grave complications in the shape of abscesses, fistulous tracks or actual perforation of the gut.

The symptoms of simple stricture of the rectum may be divided into two groups. In the earlier stages of the disease the symptoms are referable to the exciting proctitis, but when the disease has existed for some time the symptoms of mechanical obstruction with ulceration supervene.

Treatment has so far been very hopeless. Excision of the rectum has not given as good results as might have been expected from so radical a method. Relapses have been common after this treatment.

Linear proctotomy is usually followed by relapse, or if done with freedom may be followed by permanent incontinence. The author insists on the preliminary treatment of the proctitis and ulceration. This he carries out by a slight dilatation of the stricture followed by the regular use of warm antiseptic injections. As the proctitis improves the stricture is further dilated. In order to prevent relapse it is advisable in suitable cases of short strictures with no great fixation to perform a plastic operation, which is carried out on exactly the same lines as pyloroplasty.

E. D. TELFORD.

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Pathology.

An Investigation into the Lymphogenous Origin of Toxic Infection of the Central Nervous System.

ORR (D.) and ROWS (R. A.). *Rev. of Neurol. and Psych.*, May, 1907.

IN peripheral nerves, spinal roots, and cranial nerves there is a constant stream of lymph ascending towards the central nervous system whose main current lies in the inner meshes or lymph spaces of the fibrous perineural sheath. Toxins reach the spinal cord and brain by this channel; and although they spread to some extent in the lymph spaces of the pia-arachnoid, and so affect structures at a distance from their point of entry, for the most part they pass, in the main current of the lymph, along the nerve roots into the substance of the central nervous system. Here they apparently follow the nerve paths of the affected roots, and show little tendency to diffuse amongst the neighbouring fibres.

In their extra-medullary portion these nerves are protected from the influence of the toxins by the vital action of the neurilemma sheath, but on losing this in their intra-medullary part they at once undergo degeneration.

The first change is a primary degeneration of the myelin; the axis-cylinders and nerve cells are evidently affected later.

The writers are now investigating a case of general paralysis which bears out to a very marked degree the experimental and clinical evidence given above. At the autopsy the following morbid appearances were found, suggesting the presence of some infective condition, *e.g.*, acute catarrh and ulceration of the large intestine with hæmorrhages, especially of its lower portion, chronic thickening of the mucous membrane of the bladder, with an acute cystitis and very offensive blood-stained urine. In addition there was a septic condition of the right knee-joint which had existed for two weeks previous to death. Cultures were made from the cerebro-spinal fluid of the lateral ventricles and of the lumbar region, and yielded an abundant growth of a rod-shaped bacillus which often assumed a long thread-like form. In sections of the right sciatic nerve no organisms were found, but they were abundant in the following regions, viz., in the internal layers of the perineural sheath of the posterior and anterior lumbar roots, amongst the fibres of the posterior root entry zone, in the pia-arachnoid around both sides of the cord, and in the septa passing into the cord where they were most numerous at the periphery, amongst the anterior root fibres, and

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a few in the central canal and surrounding tissues. In the spinal roots the organisms also followed the track of the vessels passing into the centre of the nerves. In both roots and cord there were many in the adventitial lymph spaces of the vessels, but nowhere was a single organism within the lumen observed. The vessels were dilated, and there was cellular infiltration of their walls. In the cord the organisms were found to be limited to those areas which we have shown to be affected as a result of toxic absorption.

The presence of the organisms in the adventitial sheath of the vessels and their entire absence within the lumen are facts of very great significance. The writers suggest that this infection of the adventitia is secondary to the infection of the lymph circulating amongst the nerve fibres. In support of this view they mention that it is frequently found, in advanced phases of cord degeneration, that the fatty products in process of granular disintegration and absorption pass into the adventitia and fill the cells and spaces there until the vessel wall may be stained almost uniformly black with osmic acid. It is possible that this is the true explanation of the vascular changes found in the cord in acute myelitic lesions, and that these should not be considered as being of primary hæmatogenous origin, but as being reactive changes due to a primary lymphogenous infection of the adventitia of the vessel walls.

E. M. Brockbank.

On the Pathogenesis of Pernicious Anæmia.

Tallqvist (W. T.). *Zeitschr. f. klin. Med.*, 1907.

This lengthy paper communicates the results obtained by the author in a series of experimental investigations on the cause of pernicious anæmia, especially in relation to that form which is due to the presence of the bothriocephalus latus. Along with other active substances in the proglottides of the worm, is a fat-like substance which possesses hæmolytic properties; it is not secreted and it forms no anti-bodies. This lipoid substance produces anæmia in animals whether given by subcutaneous injection or by the mouth. It is liberated by partial or complete destruction of the proglottides, and the resultant anæmia is probably caused by absorption of the hæmolytic substance thus set free in the intestinal canal. Of the flat-worms, the bothriocephalus alone possesses blood-destroying properties. Substances which have closely allied properties to this hæmolytic agent occur in several normal organs and especially in the mucous membrane and glands of certain parts of the digestive tract. In the crytogenetic form of pernicious anæmia, it becomes a question

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whether, in a number of these cases, qualitative or quantitative changes in fat-metabolism take place somewhat resembling a pathological secretion of a hæmolytic lipoid substance. Substances possessing similar properties are met with in malignant growths, in a high degree in cancer of the stomach, and are probably responsible for the accompanying anæmia.

The inferences to be drawn from these investigations are—that certain substances of a lipoid nature play an important part in the pathogenesis of pernicious anæmia; and also that numerous circumstances show the important bearing of the enterogenous factor in the elucidation of several forms of this anæmia. The duration of the intoxication, which is of great weight in the development of a chronic anæmia by blood destruction, must be considered both from the experimental and the clinical standpoints. An anæmia first manifests itself after the damage sustained has led to a relative insufficiency of the hæmopoetic function.

The Cause of Orthopnœa.

HOFBAUER (LUDWIG). *Zeitschr. f. klin. Med.*, 1907.

THE patient who suffers from orthopnæa cannot maintain the recumbent posture; he is obliged to sit up in order to "get his breath." The usual explanation of this is, that in the sitting posture the extraordinary muscles of respiration which the difficulty of breathing calls into action, have their moveable points of insertion better fixed than when the body is recumbent. Moreover, the sitting or standing posture is more favourable to the full expansion of the thorax. Doubting the sufficiency of this explanation, the author made a number of experiments, on man, with the aid of a Marey's pneumograph and recording apparatus. A number of measurements of the intra-thoracic pressure in cases of empyema are quoted, which show that the negative pressure is much greater when the patient is in the sitting, than in the lying posture. This is attributed to sinking of the diaphragm when the trunk is in the vertical position. When the patient is lying on the back, the abdominal viscera tend to fall to the spine and thus to press up the diaphragm and increase the positive thoracic pressure. Hofbauer concludes that, in diseases of the pleura, the patient prefers to sit rather than to lay, not because by doing so he can use the accessory muscles of inspiration to better advantage, but because the diaphragm falls downwards and thus increases the elastic power of the lungs. By this aid to the expiratory power, the air-hunger of the patient is materially diminished.

J. DIXON MANN.

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A New Animal Anti-toxic Serum for Microbic Infection in Man.

DEUTSCHMANN. *Munch. med. Woch.*, May 7th, 1907. Pp. 921–3.

DEUTSCHMANN describes a new serum produced by inoculations of increasing doses of yeast into animals. Animals as treated exhibit an increased resistance to microbic infection. The serum, he upholds, is of great assistance to the human organism as a protection against pneumococcus, staphylococcus and streptococcus infections, and reports cases mostly of eye infections which recovered after repeated inoculations of small doses of this serum. The serum itself is harmless and he advocates its use in pyæmia, erysipelas, influenza and suppurative skin lesions. If subcutaneous inoculations are contra-indicated by some idiosyncrasy, rectal injections in double doses by means of a fine bore syringe are recommended. He claims that his serum can be used for a long time before producing the so-called serum-symptoms. The average dose is 2 c.cm., and Deutschmann advertises the laboratory from which it can be bought.

J. M. BERNSTEIN.

On B. Coli Infections.

FEHLING (H.). *Munch. med. Woch.*, 1907, No. 27.

THE writer brings forward some points in connection with colon bacillus infections in pregnant and puerperal women. The best known of these is pyelonephritis. He cites two cases in support of the view that the infection in these cases is an ascending one. Vesical catarrh is always present at first and the urine in the bladder shows a pure culture of B. Coli. The affection usually remains local, B. Coli rarely invading the blood-stream. As an apparent exception to this, he relates a case of severe pyelonephritis in pregnancy where fever was present for 14 days ante partum. The blood of the mother and of the child at birth were sterile. On the 4th day of the puerperium defervescence occurred, though bacteriuria lasted longer. After 14 days the mother's blood serum gave agglutination with urinary B. Coli in a dilution of 1 : 250, but he thinks this may be explained by the entrance of agglutinins into the mother's blood from that of the fœtus by the placenta Further investigations of maternal and fœtal blood in respect of their agglutinating properties may show whether B. Coli does invade the maternal blood in these cases.

Pyelonephritis in pregnancy may become a serious matter. If the pyrexia be prolonged, and especially if both kidneys become involved, abortion may occur or induction of labour may be

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called for. As regards uterine infection, the writer has seen only two cases of undoubted invasion of the uterine cavity by B. Coli. Normally the upper part of the vagina and the cervix resist its entrance.

Case I. Primipara with vesical catarrh and right pyelonephritis: high fever for 10 days in the seventh month resulted in miscarriage. Maternal blood sterile. Blood from umbilical vein contained B. Coli as also the uterine discharge. After the labour rapid defervescence occurred and recovery. The child died in 24 hours and B. Coli was found in the blood of the heart.

Case II. Primipara, seven months, feverish, paroxysmal abdominal pains. All organs apparently normal. Uterine infection diagnosed and labour induced by rupture of membranes. Liquor amnii taken with all precautions showed B. Coli besides streptococci and staphylococci. Blood of mother and of umbilical vein sterile. Child died in 24 hours and the heart's blood contained B. Coli and cocci. The mother rapidly lost her fever and recovered.

In such exceptional cases he suggests that the bacillus reaches the uterus during pregnancy, penetrates the membranes and is absorbed by the fœtus with the liquor amnii. Hence the uterine and severe fœtal infection, while the mother recovers rapidly. He suggests that some cases of obscure fever in pregnancy may on proper investigation prove to be of this nature.

Lastly B. Coli infection, though rarely, may occur in the puerperium, and the writer's only death after pubiotomy was so caused. Fever appeared on the third day with rigors and pulmonary signs. From the 40th day B. Coli could be demonstrated after the rigors in the blood, sputum, urine and sweat, in pure culture. In the afebrile period the blood was sterile. She died on the 68th day and the autopsy revealed a pure colon infection originating from the bone wound, with parametritis and thrombophlebitis. This is the 8th case of pure colon infection recorded in the literature. The lessons from the case are that subcutaneous division of the bone is to be preferred, with continuous catheterization for the first few days, and firm pressure applied. With regard to the other classes, pregnant women and midwives should be impressed with the importance of judicious cleansing of the vulva.

G. R. Mill.

"La Resistance Globulaire Normale chez l'adulte."

Chauffard and Rendu. *La Presse Médicale,* June, 1907.

After briefly reviewing the recent work done on this subject, the authors conclude that the physiological range of resistance of the red corpuscles has not received sufficient attention. They

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take as the index of resistance, the degree of concentration of a solution of sodium chloride necessary to produce hæmolysis. They find that there are very considerable variations in the requisite degree of concentration, met with in the blood normally. In their paper, the authors shew curves indicating the points at which hæmolysis just begins, when it is definitely established and when it is complete.

They confirm the statements that in jaundiced blood the resistance is markedly decreased below the minimal of the normal resistance. The authors conclude their paper by a table of cryoscopic indices corresponding to the various degrees in concentration.

DONALD CORE.

Bacteriological Investigation of an Epidemic of Food Poisoning.

LAJEOT and HAIBE. *Archiv. Méd. Belge,* January, 1907. Pp. 1—32.

LAJEOT and Haibe of the Bacteriological Institute of Namur detail their investigations into an epidemic of food poisoning occurring simultaneously in many garrisons throughout Belgium. The symptoms exhibited were colic, frequently fetid, diarrhœa, pyrexia (100·4°—104°), weakness, thirst, loss of appetite and nervous symptoms such as pains in the head, back and limbs. In the severe forms trismus and convulsions were specially marked. The onset was sudden and after lasting 3 or 4 days the acute symptoms rapidly disappeared; the convalescence was prolonged and there was general weakness and lassitude; 3 patients desquamated on the hands and feet (Gaertner considers this pathognomonic of food poisoning). About 500 men were attacked. All these had partaken of meat that had been boiled for a long time. None of the meat could be obtained by the investigators and no specific bacilli could be found in the stools or blood so they were compelled to resort to the serum reaction for diagnosis. Various species of the B. of Gaertner—which has been repeatedly isolated in epidemic diarrhœa since Gaertner first described it in 1888 occurring in calves suffering from gastro-enteritis and in the spleen of patients infected—were agglutinated completely by the blood sera of all the patients in dilutions of 1 in 200. Many gave the usual group agglutinative reaction with B. Typhosus in 1 in 10. The sera were found to also agglutinate bacilli isolated from similar epidemics of older date.

Animal experiments showed that the toxins of B. Enteriditis are not destroyed by prolonged boiling. Intra-peritoneal inoculation of rabbits and feeding of dogs with cultures boiled for 3 hours produced a transitory illness and for some weeks after-

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wards the animal's sera gave agglutination phenomena comparable with those described above.

Hence they conclude that (1) the epidemic was the result of alimentary intoxication by dead bacilli and their toxines of the enteriditis group; (2) by sera reaction alone it is possible to specify the kind of intoxication if studied within a month after the outbreak, but for this it is necessary to use various strains of B. Enteriditis; (3) the toxines of B. Enteriditis resist prolonged boiling, and no cooking destroys them; but boiled meats are less dangerous than roasts or stews.

J. M. BERNSTEIN.

The Serum Reaction in Malta Fever.

STEFANELLI (P.). *Riv. crit. di Clin. med.*, 1907, p. 493.

DIFFERENT authors have estimated the value of the agglutination reaction in Malta fever at different values; many consider that the presence of the reaction proves that infection with the *Micrococcus melitensis* has taken place, while Könrich obtained a positive reaction at a dilution of 1 :500 with the serum of persons free from the infection. Stefanelli, using samples of the Micrococcus derived from several laboratories, obtained different degrees of virulence in them by the method of passage, inoculating them subdurally into very young rabbits and recovering them from the nervous system. He found that the infection (whether intravenous, peritoneal, or subcutaneous) of rabbits with these more or less virulent micrococci always caused the appearance of a positive agglutination in from 1 to 6 days; as a rule it appeared at the end of the first week or at the beginning of the second. With subacute or chronic infections a positive reaction might be obtained at a dilution of 1 : 1500; in the severe acuter infections, at a dilution of perhaps 1 : 300 only; and when death occurred in from 1 to 6 days, at a dilution of 1 :30 or less. The serum might still possess some agglutinating power 3 or 6 months later. Different stocks of the Micrococcus shewed different degrees of agglutinability, and the agglutinability of any one stock varied according to the media employed in its culture. Young cultures should always be employed, as spontaneous agglutination may occur in old cultures—very possibly Könrich's experiments were made with old cultures. The serum from animals infected with the Micrococcus did not agglutinate typhoid or paratyphoid bacilli, B. coli, staphylo- or streptococci, or the pneumococcus: the sterile serum, kept at 20° or at 5°, lost none of its agglutinating power in 6 months, but all of it in 8 months; the power was lost after 2 months exposure to the light, and after heating to 65° for 5 minutes.

Examining a number of patients with Malta fever, Stefanelli

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isolated the Micrococcus from the blood of 2 of them. Their serum agglutinated cultures of these Micrococci at dilutions of 1 :250 and 1 :500; but the stock obtained from Kral was not agglutinated beyond dilutions of 1 :100 and 1 :300 in these two cases respectively. Other patients with Malta fever gave positive reactions at dilutions varying from 1 :30 to 1 :150, but their blood gave no growth of the Micrococcus. Out of 10 cases of lobar pneumonia, in which the pneumococcus was grown from the blood in 8, the serum agglutinated the Micrococcus in a dilution as high as 1 :10 in one case only. Out of 3 cases of staphylococcal septicæmia, the serum in one agglutinated the Micrococcus at a dilution of 1 :20, the staphylococcus at a dilution of 1 :100; the serum in the other two cases did not agglutinate the Micrococcus. In two cases of puerperal streptococcæmia, the serum did not agglutinate the Micrococcus. Among 15 certain cases of enteric fever, in one the Micrococcus was agglutinated at dilutions as high as 1 :15 and 1 :20; this case gave a Widal's reaction at 1 :150, and the B. Typhosus was cultivated from the blood. In 30 cases of pulmonary tuberculosis, positive reactions with the Micrococcus were obtained at dilutions of 1 :15 and 1 :20 in 2 advanced cases. In 5 patients with malaria and 35 patients with gastric cardiac renal or nervous disease, the serum did not agglutinate the Micrococcus. Stefanelli concludes that for practical purposes Malta fever may be diagnosed if the patient's serum agglutinates the Micrococcus at dilutions of 1 : 30 or more.

A. J. Jex-Blake.

A Reaction for the Differential Diagnosis of Pus.

Widerö (S.). *Norsk. Mag. f. Laegevidenskaben,* 1907, p. 881.

The author discusses the various methods that have been used in diagnosing the origin of specimens of pus. (1) Macroscopically, tuberculous pus is usually thinner than acute inflammatory pus, and tends to separate into two layers on standing, a turbid upper serous layer, and a thick precipitate. (2) Microscopically, tuberculous pus is usually composed entirely or mainly of lymphocytes shewing marked signs of caseous change or degeneration; while pyogenic pus contains mainly polymorphonuclear white cells, only a few of them shewing degenerative changes. (3) Staining for bacteria generally shews that microbes are present in pyogenic pus; the tubercle bacillus can rarely be demonstrated in tuberculous pus by staining, but injection of the pus into guinea-pigs affords a fairly certain method of diagnosis. (4) The biochemical method; lymphocytes do not contain a proteolytic ferment, while polymorphonuclear leucocytes do. Drops of the pus are placed on serum in a Petri capsule and are kept at 50°—55°C. for 24 hours; if a proteolytic ferment is present, the

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drops sink down into the serum. Practically speaking, if no proteolysis takes place, the pus is tuberculous; if weak proteolysis occurs, the pus may be due to a mixed tuberculous infection, or may come from a tuberculous focus which has been treated with iodoform—which is positively chemiotactic to polymorphonuclear leucocytes—or may come from a non-tuberculous focus, but be contaminated with blood which prevents the occurrence of proteolysis; and if much proteolysis is seen, the pus is probably not tuberculous, but pyogenic. (5) E. Müller (1907) has described a physico-chemical method of diagnosis. Millon's reagent is placed in a small porcelain dish, and 1 or 2 drops of pus are floated into the middle of it. Tuberculous pus forms a fairly tough membrane round itself; the membrane can be lifted up on a wire loop without breaking in pieces, and the drop of pus forms a pea- or bean-shaped mass if it is pressed down into the fluid. Non-tuberculous pus forms a layer on the fluid, breaking up if the attempt is made to raise it up on a wire loop; and it gives rise to a red discolouration of the fluid within 15 minutes, whereas tuberculous pus does not do so. Both varieties of pus are stained red in 1–2 minutes. The reaction is due to the presence of the decomposition products of protein in non-tuberculous pus. Non-tuberculous pus, if very thick, may form a membrane, but the red colouration of the Millon's fluid will shew that the pus is non-tuberculous.

Wideröe has tried these 5 methods on 20 samples of pus, and records his results in tabular form. The pus was from cases diagnosed clinically as tuberculous in 9 cases; in all of these Müller's reaction was positive, there was very slight reddening of the Millon's fluid in 2 of the cases, and tubercle bacilli could not be found in any of the specimens of pus. In the 11 pyogenic cases, the reddening of the Millon's fluid was absent only twice: as regards the formation of a membrane sufficient to enable the little mass of pus to be lifted from the fluid, Wideröe remarks that the size of the mass is of great importance. If only one drop of non-tuberculous pus is used, the mass may be firm enough to stand lifting on the loop, but not if 2 drops are put together into the Millon's fluid. Two drops of tuberculous pus, on the other hand, form a single mass that can be lifted out of the Millon's fluid. Blood forms a firm coagulum in Millon's fluid, and therefore non-tuberculous pus containing blood will naturally react to Müller's test as if it were tuberculous. As regards the presence of a proteolytic ferment, 4 of the 9 tuberculous cases gave no proteolysis; the other 5 were cases with fistula, and shewed scanty to marked proteolysis. The 11 non-tuberculous cases all exhibited marked proteolysis.

A. J. Jex-Blake.

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Rupture of Softened Anthracotic Glands into the Bronchi.

SCHMIDT (A.). *Deutsches Arch. f. klin. Med.*, 1907, 90, p. 142.

IN 1905 Vansteenberghe and Grisez endeavoured to shew that the transference of sooty or insoluble particles into the peribronchial glands could take place from the alimentary canal as well as from the respiratory tract. Schmidt remarks that this view has since met with the refutation it deserved; and goes on to emphasize the danger of anthracotic induration of these glands, which Ribbert believes to be commonly due to tuberculous infection and not directly to their infiltration with the particles of soot or dust, on the grounds that they may become infected at any moment with more virulent organisms and break down, discharging their softened contents into any neighbouring tissue or cavity. Riebold believes that the acute infection of these enlarged and hardened anthracotic glands often takes place through the blind ends of the traction-diverticula of the œsophagus to which they may give rise; Sternberg thinks this method of infection rare; Chiari believes the infection is generally tuberculous and acute in young persons, tuberculous and more chronic in the old. The frequency with which these glands perforate into the bronchi or pulmonary vessels has been variously estimated; Schmidt thinks that the event is of frequent occurrence at Dresden, where pulmonary anthracosis is very common, and has recorded 66 cases of it in 4 years; it is usually associated with tuberculosis of the lungs.

A small rupture into a pulmonary vein may be the cause of no more than deposits of pigment in various parts of the body; but as a rule the results of perforation, whether into a bronchus, vein, or artery, or into the pericardium, pleura, or œsophagus, are very serious. Perforation into the bronchi or trachea causes aspiration-pneumonia resulting in suppuration or gangrene, and this is particularly likely to happen when the softening is due to infection from an œsophageal diverticulum. Putrid bronchitis may similarly result from the perforation. Clinically, such perforation is to be diagnosed when a middle aged or old patient developes putrid bronchitis or aspiration pneumonia, either acute or chronic, advancing by irregular steps; the affection is often unilateral, or confined to a single lobe of the lung; frequently there is spontaneous pain, or pain on swallowing or on pressure, in a circumscribed area about or below the manubrium sterni, corresponding to the position of the peribronchial glands; dulness on percussion, or a skiagraphic shadow, may be found in this region. Particularly characteristic is the sputum, which from time to time contains small black masses up to the size of a lentil, which are seen under the microscope to consist of pigment, detritus, crystals of calcium salts or cholesterin, and leptothrix filaments.

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Therapeutically, feeding through an œsophageal tube should be tried for long periods, particularly if an œsophageal diverticulum is suspected; when unilateral putrid bronchitis is to be treated, the artificial production of pneumothorax or the injection of NaCl solution into the pleural cavity may be thought of.

A. J. JEX-BLAKE.

The Œdema of Renal Disease.

HEINEKE (A.) and MEYERSTEIN (W.). *Deutsches Arch. f. klin. Med.*, 1907, 90, p. 101.

AFTER a brief résumé of the modern views on the cause of œdema in renal disease, the authors give details of their own work upon the œdema occurring in rabbits suffering from acute nephritis due to the subcutaneous injection of potassium bichromate or of uranium nitrate. They found that the occurrence or the absence of œdema does not depend upon any single factor; œdema is commoner in uranium nitrate poisoning than in poisoning by bichromate, but microscopical examination of the kidneys affords no explanation of the fact. They think it probable that the uranium salt gives rise to œdema by injuring the capillary wall, so that œdema may be found although the kidney is not much affected; the bichromate acts by causing extensive necrosis of the epithelium in the renal tubules, so that œdema does not occur unless the kidney is severely injured. Rabbits with this "bichromate nephrosis" exhibit more extensive œdema after the administration of water; NaCl does not cause the appearance of œdema in rabbits poisoned with uranium nitrate. The transsudates (ascites or pleural effusion) contained more NaCl than the blood-serum, and if the percentage of NaCl in the serum rises in consequence of NaCl-retention, the percentage in the transsudates rises still more; the differences cannot be set down to the smaller amount of albumen contained in the transsudate, and the authors believe that an active secretion of NaCl by the capillary endothelium is at work, removing NaCl from the blood-serum. When the kidneys have been extensively injured, and the NaCl -content of the serum is high and the amount of urine secreted low, the urine may contain less NaCl per cent. than the serum; this suggests that the urinary NaCl is secreted by the tubuli contorti.

A. J. JEX-BLAKE.

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Therapeutics.

A Plea for the Scientific Treatment of Stammering.

LANGWILL (H. G.). *Review of Neurology and Psychiatry*, April, 1907.

IN this article the writer attempts to direct the attention of the profession (and especially its teachers) to the urgent need for this too common condition being regarded as not only within the province of the medical profession (rather than a mere subject for any so-called stammer-curer to undertake the treatment of) but as offering in most cases a very large measure of success if the treatment is carried out on proper physiological lines. He points out that the cause of the neglect of the condition is to be put down not merely to the indifference of the patient's relations and friends but in no small measure also to the lack of teaching of undergraduates upon the subject and an almost equal lack of definite instruction in the ordinary text-books of medicine, although many other varieties of neurosis receive a large amount of attention both in clinical teaching and in text-books.

The method of treatment which is urged by the writer is that introduced by Prof. John Wyllie of Edinburgh University in 1891, described in his work on "Disorders of Speech," a book which from its very nature is comparatively rarely found in the hands of the general practitioner, the result being that Wyllie's excellent and practical teaching on this important subject is to no small extent unknown to the bulk of the profession. The essential feature of Wyllie's treatment is based upon a recognition of the fact that in by far the largest number of stammerers their difficulty arises from a lack of promptitude and efficiency in the co-ordination of the twin mechanisms concerned in speaking (viz., vocalisation and articulation) the practically constant mistake of stammerers being this—viz., that too much attention is bestowed upon *articulation* while *vocalisation* is comparatively *neglected*, the stammerer often making exaggerated articulatory movements as if to make up for his lack of vocalisation. How all important the part of vocalisation is in the case of stammerers is well shown by the fact that practically never does any pupil stammer in *singing* when his attention is especially directed to the *sound* of the words. Some other similar interesting illustrations of the importance of attention to vocalisation are given by the writer from his own experience. After pointing out the great value of Wyllie's "Physiological Alphabet," in which the letters are grouped according as they are "voiceless" or

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" voiced," the writer discuses in detail some of the more important " stumbling blocks " of pupils, and shews how these are to be overcome. The importance of proper breathing (so as to enable the pupil to have a good command of air in his chest for vocalising) is alluded to, and finally the all important part which the perseverance of the pupil in his exercises must play is insisted upon by the writer who remarks " the chief difficulty is not in getting the pupil to understand the treatment but in getting him to carry this out perseveringly."

AUTHOR'S ABSTRACT.

Some Physiological Effects of High Frequency Currents in Disease.

SLOAN (S.). *Lancet,* June 8, 1907, p. 1517.

THE indiscriminate use of high frequency currents both as a local and as a general application has brought this agent into disrepute. The dramatic effects appeal to the ignorant and it has become the stock-in-trade of the charlatan, so much so that the profession almost looks askance at any medical man who uses it in cases other than such as might reasonably be affected by suggestion. We have seen practically no scientific work done on the subject for years and must welcome this effort to solve some of the problems of the effects produced.

The general sensation is one of well-being and restfulness and patients nearly always make some remark about this after the first treatment. Dr. Sloan has directed his efforts chiefly to a study of the effects on the cardio-vascular system. It has been freely stated, especially in the French press, that the effect of treatment is to lower the blood pressure by means of dilatation of peripheral vessels. This observation is confirmed but further investigation shows that this is only a small part of the action on the cardio-vascular system. By means of blood-pressure and pulse charts it conclusively proved that the action is a two-fold one, *i.e.,* on the peripheral vessels and directly on the heart muscle. The action on the heart muscle is that of a cardiac tonic —a very powerful cardiac tonic—and it is remarkable to see in some of the charts when the pulse rate is rapid at the commencement of treatment how this quickly falls to nearly normal and yet the blood pressure rises very considerably: the heart is acting more effectively. The character of the pulse is of fuller volume and intermissions become less frequent. With a regular course of treatment this improvement is maintained and patients do not relapse as soon as the applications are discontinued. Dr. Sloan finds the best results are obtained after all the benefit possible has been derived from drugs and when these have failed to materially benefit the patient.

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In summing up he finds that in all cases there is a preliminary diminished peripheral resistance and this may be so marked as to cause fainting in cases where the heart cannot immediately respond. This is followed sooner or later by increased cardiac force and the final result on the pulse-rate and blood-pressure depends on the cardio-vascular stability. If this is normal then there will probably be no change in either but there will be an increased flow of blood. In abnormal cases the final result depends on many circumstances such as the blood pressure and pulse rate before operations were commenced. Whatever these may have been before or after treatment the result is an increased flow of blood in all cases.

In dealing with the urinary system Dr. Sloan has not been able to obtain order out of chaos. The effect on the excretion of urine is uncertain although quite marked. The case is cited of a man who recovered from uræmic coma that lasted a week. Convalescence was delayed and he made no progress for 10 weeks. The pulse remained at about 100 and no medicine seemed to have any effect. After a lapse of 10 days without drugs high-frequency treatment was commenced with the result that the pulse fell to 83 after three applications and remained at about 85. The improvement in the patient's condition coincided with the improvement in the pulse and the urinary excretion rose from an average of 25·5 oz. per day to 29·8. Unfortunately there are no reliable blood pressure figures with this case.

The effect on the appetite and general health is marked in many cases and he suspects that this is brought about directly by the passage of the currents through the intestinal canal.

Dr. Sloan has worked carefully and has done his utmost to eliminate sources of error, but he fully realizes that his investigations are far from complete and suggests the formation of a scientific committee of investigation to go into some of the very difficult questions which his paper raises. After reading this contribution we feel less surprise at the success of "Electro-therapeutic Institutes" when this treatment is used indiscriminately by unqualified persons—especially on patients who are "run down."

A. E. Barclay.

A Conjunctival Tuberculin-reaction.

Calmette (G.). *La Presse Médicale*, 1907, No. 49, p. 388.

Von Pirket (*Münch med. Woch.*, 1907, pp. 865 and 905) has shewn that when a small amount of tuberculin is introduced into a scarification made on the skin of a patient with tuberculosis, a sharp local reaction results, and a papule drying up in 8 days is formed; whereas in the healthy subject this cutaneous

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reaction appears to be exceptional. Vallée has extended this reaction to bovines with success. Calmette, adopting an idea of Wolff's, has examined the reaction to tuberculin of the human conjunctiva, both in tuberculous and non-tuberculous patients. Tuberculin precipitated by alcohol, dried, and dissolved in sterilised water, was employed, in 1 per cent solution. A drop of this solution, recently prepared, was instilled into one eye of each patient. In 3—5 hours the palpebral conjunctiva shewed a marked reaction in tuberculous persons, becoming congested, œdematous, and even covered with a slight fibrinous exudation, while lacrimation occurs. The reaction reaches its maximum from 6 to 10 hours after the instillation, and fibrinous filaments collect in the inferior conjunctival sac. Little pain is felt; chemosis is not observed; no physical disturbance occurs. The reaction is over in 18 hours in children, and in adults in 24—36 hours. In the non-tuberculous this tuberculin instillation is without effect; at most a slight congestion appears within 3 hours, unaccompanied by lacrimation or fibrinous exudation. Calmette obtained a positive reaction in 15 tuberculous cases and in 1 (of bronchitis) in which tuberculosis had not been suspected. In 9 non-tuberculous cases the reaction was negative.

A. J. Jex-Blake.

The Physical Treatment of Tabes Dorsalis.

Tobias (E.) and Kindler (E.). *Berlin klin. Woch.*, 1907, Nos. 9 and 10.

Under the heads of diet, massage, gymnastics, compensatory exercises, hydrotherapy and electrotherapy, the writers treat of such measures as may be usefully employed, in the absence of a specific therapy or prophylaxis of tabes, to conserve the health of the patient and retard the progress of the disease. Such measures are to be deduced from experience as to the etiological factors and from a consideration of the various theories in vogue. There is no special diet for tabes, but the protracted course demands that the strength of the patient be carefully maintained, and for this reason meat should not be altogether excluded. Alcohol may be allowed in moderation but not when marked neurasthenic symptoms are present. In obese subjects too energetic reduction must be avoided. Constipation and diarrhœa are best treated by regulating the diet. Massage is useful in three ways; for its general effects, *e.g.*, on obesity and atonic constipation; by improving the musculature and favouring tissue changes; and by an influence sedative or stimulating on the symptoms of the tabetic process itself. General gymnastic treatment is indicated but an arbitrary use of gymnastics is to be avoided.

As regards the system of compensatory exercises instituted by Fraenkel, it is necessary to observe constantly their effect on

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the general condition. The writers have never seen good result from exercises in acute cases. Caution must also be observed in cases where symptoms of fatigue make their appearance, though it is seldom necessary to suspend them altogether, and in most cases simple movements may be continued without harm. If the tabetic process shows signs of arrest one can go on to more complex exercises, at first with the eyes open and then with eyes closed. It is advisable to have the exercises carried out twice a year under daily supervision in the form of a 4 to 6 weeks' cure. Severe cases should be removed to a sanatorium.

Hydrotherapy, except in rapidly progressive cases, has a favourable effect both generally and upon individual symptoms. It may influence the central organ by its action on the peripheral nerve-endings and also by improving the circulation, while it is probable that the intact parts of the nervous system have their resistance and vitality raised. In active or progressive cases good results often follow simple full baths at 35°C. for 20, 30 or even 60 minutes, followed by an hour's rest in bed. In strong and not too sensitive patients 3 kilos of brine may be added with advantage. The writers recommend two to three baths a week, and after twelve to eighteen baths a longer pause. No cold affusion should follow. In cases where the process is more or less stationary carbonic acid baths are useful—two or three at most a week of an initial temperature of 35° gradually brought down to 30°, for eight to fifteen minutes. Still more energetic are the half-baths at 34°, in severe cases, cooled down during the bath to 3°C. The initial temperature may gradually be reduced and in milder cases may be lower from the first. Particularly good effects are seen from cold packs of 20° for a half to one hour. Hot baths usually aggravate the disease. For the lightning pains three different procedures have beneficial effects: local cold affusions (18°—16°) for a few seconds only; packs at 31° up to the axillæ; and particularly the action of heat on the spinal cord by means of sand-bags or of Kohn's spinal bag through which hot water circulates at 40°—44°, for not more than half-an-hour. Cold applications to the spine must be avoided.

Electrotherapy has no influence on the tabetic process but has some reputation in the relief of pain; sometimes one form of current is effective, sometimes the other.

G. R. Mill.

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Reviews.

OXFORD MEDICAL PUBLICATIONS.

"Surgical Instruments in Greek and Roman Times." By JOHN STEWART MILNE, M.A., M.D. Oxford: Clarendon Press.

"THE object of this book is to lay before the student of medical history an account of the various instruments with which the ancient Greek and Roman surgeons prosecuted their craft." Dr. Milne worked through all the classical literature on the subject and extracted all references to instruments. Descriptions of instruments as to their shape and size were then compared with specimens in museums and private collections and with illustrations in old writers. The various instruments are arranged seriatim with extracts from the authors who describe them, and comments by Dr. Milne, who gives the original Greek or Latin descriptions, and in most instances a translation of his own.

Obviously such a work involves enormous industry and an intimate and scholarly knowledge of ancient and mediæval literature.

The first chapter is introductory and briefly historical, and ranges from Hippocrates 460 B.C. to Heister 1739 A.D., and is followed by a chapter on the material and workmanship of instruments and on the various "finds" in Italy, France and elsewhere of collections of instruments which belonged to surgeons, to oculists and to a military hospital at Baden. It is shown how most of the instruments found are made of bronze, because iron and steel instruments have largely perished not because they were not used. The art of tempering steel was known in the time of Hippocrates, and it appears that the high grade of iron ore used and the method of smelting produced steel of fine quality. However, bronze was the chief material, while pure copper, tin, lead, gold, silver, horn, wood, bone and ivory were also more or less employed. It is interesting to note that combined instruments, *i.e.*, instruments in which one end is used for one purpose and the other for another purpose, were as much as possible devised, and that as a rule the instruments were made in one piece and not made to fold into a handle. Occasionally jointed instruments are found.

In Chapter III. we have an account of the various knives which were usually of steel in a bronze handle. The form of knife varied much, and these were made sharp or blunt pointed, single or double edged and curved or straight. The form of blade also was adapted to special purposes, such as the phlebo-

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tome, and the ring knife for embryotomy, the pterygium knife and many others. Unfortunately the form of the blade is often only known by description, as the iron or steel has of course perished.

Shears or scissors were in use early in our era, but more for hair cutting than surgery—an interesting illustration of the association of the two crafts. The author quotes Celsus as to removal of omentum with scissors (forfex). They appear to have been of the spring pattern, now in use for sheep shearing or cutting grass edges.

Probes and sounds for many purposes and of various forms were in use, and here again the two ends were often adapted for different objects, and a more or less flattened (spatulate) end or a spoon or an eye are seen as survivals in modern instruments. It is interesting that the director with the guard for the frænum linguæ, which has been described as a survival, is probably not so, and the antiques of similar pattern are shown to be the result of crackling along the furrow of a hollow or grooved spatula.

The various uses of the several forms of probe are fully discussed, and it is shown that confusion may easily arise between the ligula or toilet spoon and the specillum, a more strictly surgical instrument, and indeed these were to some extent interchangeable.

Dilators, uterine sounds, bifurcated probes for adjusting snares in removing nasal polypi,* blunt dissectors and hooks sharp and blunt are also described.

Epilation forceps were important instruments, and the method of shaving by grasping the hairs in forceps and cutting them off with a knife suggests that the operations of the barber were quite sufficiently severe as to be classed as surgical.

Polypus forceps, vulsella and other forms, are noticed. Some have survived in almost exactly the same pattern to the present day.

Uvula crushers (staphylagra) appear to have been also used for crushing piles in the fashion revived by Pollock some years ago.

Bronze, horn, earthenware and glass cupping bowls are then noticed, and were used both for dry and for wet cupping.

Apparatus for injections for rectal (clyster proper), uterine, vesical, aural and nasal purposes are all dealt with; syringes, insufflators and cannulæ for drainage are also described.

In Chapter VII. the many uses of the cautery are discussed, but as most of them were made of iron few of the instruments have survived to the present time.

Raspatories, chisels, gouges, and the lenticular (fully described by Galen in the second century) are discussed in the eighth

*A similar forked probe is figured by Charles Bell (1807). The fork is used for catching or fixing the ligature.—(Rev.)

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chapter, and the method of amputating with a chisel on a chopping block is alluded to. Trephines were in use by Hippocrates B.C. 460, and in the time of Celsus had a removable pin and were driven by a thong and bow. Tooth extraction does not seem to have been in favour, and little seems to be known about special instruments for the purpose, though it appears that some existed.

In Chapter IX. catheters are further discussed. The earliest form (second century) appears to have been S-shaped, like some of the modern female catheters while the earliest female catheter is straight. The question of bladder sounds and lithotomy scoops or forceps is discussed, and it seems probable that the latter were used in Galen's time. Elaborate screw vaginal specula were in use in Pompeii, and this is a chapter of much interest to gynæcologists.

Sponges and sutures and the methods of closing wounds together with some pharmacological appliances, come next, and in Chapter XI. instrument cases and boxes are described.

An appendix gives an inventory of the specimens preserved in various museums and a bibliography. An index in English, Greek and Latin finishes the text, and is followed by 54 plates.

Two serious omissions greatly impede the reader and lessen the value of this most interesting book. The first is the absence of any table assigning a date, known or probable, for the form of each instrument, and the second is the absence of any description of the plates except the references scattered through the text.

The work has evidently been a labour of love to Dr. Milne, and his industry as well as his scholarship and critical ability justly arouse the reader's admiration. We hope the book will be re-issued with the additions suggested.

"Clinical Lectures and Addresses in Surgery." By C. B. Lockwood. The Oxford Medical Publications, 1907. Price 5s. net.

This book contains a number, thirteen in all, of clinical lectures and addresses which have appeared from time to time in the pages of the *British Medical Journal* or the *Clinical Journal*.

The papers deal with a wide range of subjects and their value and interest is very high as they summarise the original observations of a surgeon of great experience. The matter is presented in a colloquial and dogmatic style and contains much that will not be found in the text-books. The spirit of the lectures throughout is to educate the listener, to make him think for himself, and to teach him to practice those systematic and scientific methods which will prove his best safeguard against the pitfalls of clinical work. Much of the work is suggestive in character and here and there speculative questions and suggestions open up new fields of thought and research.

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In any work of this original and dogmatic character there must of necessity arise many minor matters open to criticism, but these can weigh as nothing against the real value of the book.

It is a work which every student should read before beginning his practice in the wards and we feel that the same student will in the after years of his own professional work read the book again with an even deeper appreciation of its real helpfulness.

Of the clinical lectures we would say that we have read them with a sense of envy of those who were privileged to hear them spoken.

The proprietors of the Oxford Medical Publications have done well to gather these scattered papers into a compact and handy volume.

"Surgical Emergencies." By PERCY SARGENT. The Oxford Medical Publications, 1907. Price 5s. net.

IN this book the various surgical emergencies which may arise in the course of general practice are briefly discussed and for each a line of treatment is suggested. The nature of each emergency is briefly but clearly defined, and one well recognised line of treatment is appended.

The terseness and dogmatic style of the work constitutes its value. The practitioner faced suddenly with a case demanding prompt measures will find here described one appropriate method devoid of any academic discussion as to the best way of some half dozen suggested manœuvres. The descriptions are very clear and the lines of treatment mapped out are as simple as may be consistent with efficiency. A book of this nature must be dogmatic and although there are a few points in the work open to criticism by the more experienced surgeon yet the general practitioner for whom it is written will find in it much helpful material. It is a book which we can heartily recommend to the younger practitioner who may at any moment be brought face to face with a serious emergency. Such a man will find here a readily available help to supplement his inevitably limited personal experience.

"Cancer of the Womb." By FREDERICK J. MCCANN, M.D. (Edin.), F.R.C.S. (Eng.), M.R.C.P. (Lond.). Pp. 172; 46 illustrations. London: Henry Frowde. Oxford University Press: Hodder and Stoughton, 1907. Price 20s. net.

THE appearance within recent years of several large monographs specially devoted to the subject of uterine cancer is melancholy testimony to the growing importance and evidently increasing

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prevalence of this disease. The work here under review, the result of many years careful preparation, although recording little if any solid advance in knowledge or therapeutic resource, affords on the whole an excellent and practical resumé of the symptoms, diagnosis, prognosis and treatment of cancer of the womb. The plan of the book is to select clinical examples of the various types of disease met with in practice for detailed description, each type being further illustrated by a photographic reproduction of the actual specimen soon after removal. Brief reports of 42 cases operated upon by the author are given, shewing results comparable with those published by Krukenberg. Although these were all instances of vaginal hysterectomy, the author states that he is now more frequently adopting the abdominal method, and promises to give results later.

The paramount importance of early diagnosis is fully insisted upon, stress being laid upon early local examination, friability, free hæmorrhage after the slightest manipulation, ulceration, or the definite occurrence of new growth in the cervix, with the microscopical examination of an excised nodule.

The author is quite optimistic about the results of radical operation in the early stages; he would, however, with Schauta, advocate that in future the upper half of the vagina should be removed in all operations for cancer of the cervix, whether by the vaginal or abdominal routes.

A chapter is devoted to the treatment of inoperable cases, and finally the after-treatment of operations for cancer of the uterus as practised by the author is fully described in the hope that the methods recommended will be given a fair trial by others.

"Auscultation and Percussion, together with the other methods of Physical Examination of the Chest." By SAMUEL GEE, M.D., F.R.C.P. London: Henry Frowde, Oxford University Press, 1907. Price 5s. net.

THE name of the author and the fact that this is the fifth edition of the book testify to its value and make it necessary for us to say only a few words about it. It is one of the publications of the Oxford Medical Series and is a scholarly production dedicated to the memory of Lænnec and abounding with references to historic names. The first half of the book deals with methods of examination and the significance of various physical signs. In the second half of the book an account is given of the more common cardiac and pulmonary conditions and the physical signs associated with each. There is no part of medicine that is so difficult to write about and attempt to explain as the phenomena of percussion and auscultation and the author has successfully overcome the difficulties in most respects. We must

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say, however, that especially from the point of view of teaching students we are of opinion that the mode of description adopted by Steell in his handbooks on clinical signs of heart and lung disease is the more satisfactory. The note given by an emphysematous chest is much better described as hyper-resonant following Steell than as a note that tends to become tympanitic as in the present volume.

The book is of convenient size and is excellently printed.

"The Operations of General Practice." By E. M. CORNER, M.A., F.R.C.S. (Eng.), and H. J. PINCHES, M.A., M.B., B.C. (Cantab.). Pp. 296, 170 illustrations. London: Henry Frowde; Hodder & Stoughton, 1907. Price 15s. net.

THIS work is primarily written for young practitioners who have not had the advantage of holding a hospital appointment, to such it should prove a great boon. Although most of the operations described are of a simple nature—so simple as to be deemed unworthy of notice in most surgical text-books—they are calculated to cause some uneasiness to the man who performs them for the first time, and has perhaps not even seen them done by another. By carefully following out the directions, and studying the illustration here given the veriest novice should be enabled to acquit himself honourably on such occasions. He will no doubt soon find that even in the simplest of procedures experience counts, but it is well to know the best way of doing a thing—and there is a right way even of giving a hypodermic injection. The beginner will probably content himself at first with opening abscesses, removing small tumours, enlarged glands, foreign bodies, etc., passing catheters, curetting the uterus, tapping the chest, etc., performing circumcision, tracheotomy, intubation, etc., later, as confidence is gained, he may undertake thoracotomy, cystotomy and herniotomy, and the authors even forecast that appendicotomy will become a general practitioner's operation. As remarked in the introduction, "The work undertaken by a doctor in general practice is not decided by what he is capable of doing but by what he is willing to undertake. It is not worth his while to undertake anything which will not yield a successful result. . . . Personal experience alone can tell a man what to touch and what to leave, and this experience can be gained only after leaving a hospital." With a trusty guide, such as this book should be, to hand, the general practitioner should have little difficulty in enlarging his experience, and there can be little doubt he will be better thought of by his patients if he can, on occasion, successfully tackle an operation himself, instead of merely ordering the patient off to a hospital or a "specialist."

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"Medical Lectures and Clinical Aphorisms." By S. J. GEE. Crown 8vo., pp. viii. and 308, 2nd edition. The Oxford Medical Publications. London: Henry Frowde, and Hodder & Stoughton, 1907. Price 5s. net.

THIS volume is divided into fifteen chapters; the first fourteen being devoted to medical lectures; the fifteenth, which extends to 60 pages, consisting of clinical aphorisms collected by Dr. T. J. Horder. It is hardly necessary to expend any flowers of oratory in praising Dr. Gee's writings. They are sufficiently well known to many medical men and many generations of medical students. Dr. Gee is deeply versed in the history and philosophy of medicine, and his command of apposite quotation therefore is apparent on many of the pages of his "Medical Lectures"; he writes with great clearness, and with a precision of phrase that might well serve as a model to the great majority of medical authors. The book may be warmly commended to all students of medicine.

"Heart Disease and Thoracic Aneurysm." By F. J. POYNTON. Crown 8vo., pp. x. and 310, with 20 illustrations and 17 plates. The Oxford Medical Publications. London: Henry Frowde and Hodder & Stoughton, 1907. Price 5s. net.

IN this admirable and comprehensive text-book Dr. Poynton gives a summary of the most important forms of heart-disease, together with the chief methods that are employed in their clinical investigation and treatment. Dr. Poynton is, of course, well known for the work he has done upon the bacteriology of rheumatism; full weight is given in this manual to the importance of the rheumatic infection in the production of heart-disease, and in particular the pathological changes to which this infection may give rise are described with the pen of a master. The first 80 pages deal with the anatomy and physiology of the heart and with the clinical methods for the investigation of heart-disease. Then follow chapters on acute and chronic valvular disease, pericarditis, myocarditis, neuro-muscular affections of the heart, congenital heart-disease, and arterial disease and aneurysm. A few pages are devoted at the end of the volume to prescriptions and diets suitable for cases of morbus cordis, and the Schott and Nauheim treatments are briefly adverted to. Dr. Poynton's book may be cordially recommended to advanced students and to practitioners, and should bring home to anybody who reads it the very serious consequences that may follow on an apparently trivial infection with the rheumatic diplococcus.

It may be remarked that the "Oxford Medical Publications comprise, in addition to several original works, reprints,

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translations of German works, and purely American writings. Among these " Publications " is advertised a series described as " The Oxford Medical Manuals," and Dr. Poynton's excellent book is published as the fifth volume of this series. Not a single Oxford medical man, however, contributes to the " Oxford Medical Manuals "; nor is it at once obvious why the " Oxford Medical Publications " should be characterised with the name of Oxford, unless it be on the principle of *lucus a non lucendo*. The " Publications " are edited by a Cambridge man and an Aberdonian jointly; but out of over fifty writers advertised as contributing to the series, only some half a dozen appear to hold Oxford degrees. Under these circumstances the association of the name of Oxford with the " Medical Publications," excepting in so far as they are published by the Oxford University Press and Messrs. Hodder & Stoughton together, might almost be considered liable to give opportunity for misinterpretation.

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Julius Dreschfeld.

By the death of Dr. Dreschfeld the *Medical Chronicle* lost one of its best friends and one of its most practical supporters. During the twenty-three years of its existence he contributed over 30 original papers to its pages, in addition to numerous reviews of books and abstracts of other people's work, and just before he died he had promised the Editor a paper on the clinical diagnosis of perigastric adhesions. Medical literature is so much the worse for the loss of the excellent account of this important and difficult subject which he, with his large clinical experience, could have written.

By devoting three of its numbers (November and December, 1907, and March, 1908) to the publication of an account of Dr. Dreschfeld's life and work, a list of his professional writings and a series of original articles, specially written for the occasion by colleagues in the University of Manchester and former pupils, the *Medical Chronicle* wishes not only to record its appreciation of his valuable services on its own behalf, but also to join in honouring the memory of a distinguished physician and man of science.

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THE MEDICAL CHRONICLE.
A MONTHLY RECORD OF THE
Progress of Medical Science.

JULIUS DRESCHFELD.

1845—1907.

On the 13th of June, 1907, Manchester lost one of her most renowned citizens, the Victoria University one of her most prominent teachers, the North of England its most eminent physician.

Julius Dreschfeld died on that date. Though he had been afflicted for some years with lameness—due to some obscure spinal trouble—his undiminished and unimpaired mental activity and the cheerful view he himself took of his condition had calmed any misgivings or uneasiness which his friends had felt. But after a few days' illness, whilst conversing with a friend, without any sign of pain or discomfort, Dreschfeld suddenly expired.

Julius Dreschfeld was born in October, 1845, at Niederwern, in Bavaria. He received his early education in Bamberg In 1861 he came to Manchester, where his relatives were living, and he began his studies at the Owens College, then situated in Quay Street. Even when a boy he showed unusual abilities; in a few years, for instance, he mastered the language of his then adopted country to such an extent that he gained a prize in English; he also gained the Dalton Chemical Prize in 1863, and the Dalton Junior Mathematical Scholarship in 1864. He continued the study of medicine at the Royal School of Medicine in Pine Street, Manchester. But he soon left this for the University of Würzburg. The medical school of this University was then at its best; Koelliker was teaching anatomy, embryology, and histology, von Bezold physiology, Virchow had established a school of pathology, and Bamberger, who shortly thereafter went to Vienna, was one of the greatest clinical teachers in Germany. The opportunities offered for

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the study of histology, normal and pathological, at the German universities formed one of the distinguishing features between these and the English schools of those days. Dreschfeld availed himself most thoroughly of these opportunities, and thus formed the basis for his future success as a pathologist. In 1867 he took the degree of M.D. in Würzburg with a thesis on the reflex action of the vagus on the blood-pressure, based on experimental investigations carried out under Bezold's direction in the laboratory of this distinguished physiologist. In 1866 Dreschfeld volunteered as assistant surgeon in the sharp and short Prusso-Austrian war; cholera, typhus and typhoid were filling the military hospitals and required the exertions of the medical staffs.

After visiting other German universities, and also that of Paris, Dreschfeld returned, in 1869, to Manchester. He passed the examination of L.R.C.P. London, and began practice in Higher Broughton. In 1872 he removed to Oxford Road. In 1874 he obtained his first public appointment as honorary physician to the Hulme Dispensary, Manchester, and in the following year he was appointed assistant physician to the Manchester Royal Infirmary, and lecturer on pathology at the Owens College. The last two appointments offered unsurpassable opportunities to a man talented like Dreschfeld, who, endowed with an unbounded enthusiasm for work, possessed the keenest powers of observation and quick perception, a most retentive memory and a knowledge with a sound and broad scientific basis. In 1876 he became a Member and in 1883 was elected a Fellow of the Royal College of Physicians of London. In 1882 his success in the teaching of pathology, of which more hereafter, was acknowledged by his election as professor of pathology, and in the following year, on the retirement of Sir William Roberts, he became full physician at the Royal Infirmary.

In spite of the enlarged clinical work thus accruing to him, he continued teaching pathology and pathological histology. The zest with which the study of bacteriology was taken up in these years made Dreschfeld devote a long " holiday " for the purpose of studying bacteriological methods at the fountain

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head, at Koch's laboratory. But, feeling that laboratory work demanded more time than he could devote to it, he resigned, in 1892, the chair of pathology, exchanging it for the professorship of medicine. Having since his appointment at the Infirmary devoted much time to clinical teaching, and being in fact the foremost clinical teacher of the school, his previous experience as a teacher of pathology made him a most successful lecturer in medicine, reminding one of E. Wagner, of Leipzig, who also after he had held the professorship of pathology for years, had exchanged it for that of medicine. *Pari passu* with his increased responsibilities his fame as a consulting physician kept increasing, so that for many years he held the busiest consulting practice in the north of England. His renown and his merits were widely recognised by his being chosen President of the Pathological Section of the British Medical Association (1886), Bradshawe Lecturer at the College of Physicians (1887), Examiner in Medicine at the University of Cambridge (1892) and at the Conjoint Board of England (1897), President of the Medical Section of the British Medical Association (1902), and shortly before his death Lumleian Lecturer at the Royal College of Physicians.

In spite of his busy practice and his careful attention to his duties as a hospital physician, a teacher and examiner, Dreschfeld devoted much time to literary work. The appended list of his published writings, prepared by Mr. Clayton, the Librarian of the Manchester Medical Society, shows a record of over one hundred papers, and in addition there must be many others which were read before the Manchester and other medical societies without being printed. He always took a most active interest in the welfare of the Manchester Medical Society, and almost all his more important additions to medical knowledge were announced at its meetings. Moreover, in addition to reading original papers and showing interesting clinical cases before the Medical and Pathological Societies, he frequently brought to their notice important work done abroad. His literary work shows not only his great knowledge of pathology and his extensive clinical experience, but also his wide and accurate reading. Where nearly everything is good, it would be almost invidious to pick

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out single instances, but the most important additions to medical knowledge for which we have to thank Dreschfeld are the following.

He was the first to recommend in a medical journal a watery solution of eosin, with subsequent rinsing in water acidulated with acetic acid, for staining histological sections. He found it especially good for nervous tissue, in which the nuclei and nucleoli of the ganglion cells were stained a light pink. The axis cylinders of the nerve fibres and the processes of the ganglion cells were stained in a similar way, whilst the medulla of the nerve fibres was not stained; the areolar tissue took a much deeper tint. He recommended eosin especially for the examination of fresh sections for diagnostic purposes owing to the short time required for staining them. The dye had been used previously in ammonia and potash solution as a histological stain, and had been recommended for staining the salivary and lachrymal glands (*Zeitschrift f. wissensch. Mikros. u.f. mikros. Technik.* 1884. Band I., p. 376).

His paper on primary lateral sclerosis was very valuable as it confirmed the clinical observations of Erb and Charcot who had described the symmetrical progressive sclerosis of the lateral columns of the spinal cord which advanced from below upwards. Leyden had begun to doubt the independent existence of such a disease, but Dreschfeld had the opportunity of studying clinically and pathologically a typical case at the Manchester Royal Infirmary. This was the first case of the disease on which a post-portem examination was made, and Dreschfeld's anatomical findings afforded material support to the views which Erb and Charcot had expressed as a result of their clinical investigations.

He also wrote some important papers on experimental researches in the pathology of pneumonia, on the changes in the spinal cord after amputation of the limbs, on some points in the pathology of cirrhosis of the liver and of acute yellow atrophy, and he made important contributions to the investigation of the course of the fibres of the optic nerve in the brain.

In addition to the description of numerous rarer medical cases, we find, soon after the discovery of the tubercle bacillus, some investigations as to its diagnostic value published in the

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British Medical Journal (1883), and recognising the important rôle which bacteriology began to play, an important paper on "Micro-organisms in their Relation to Disease," a paper which was translated into French and Italian. Further important papers "On the Lung Complications of Diabetes," "On Creeping Pneumonia," "On Alcoholic Paralysis," "On the Clinical Diagnosis of Cancer of the Stomach," were published from 1883 to 1886. In the latter year Dreschfeld read the Bradshawe Lecture on "Diabetic Coma" giving most important original observations. In 1890 a publication on "Angina Pectoris" and a paper on "Interstitial Hepatitis," read before the International Medical Congress, deserve special mention. The following years saw a series of publications on numerous subjects, in which rare cases of diseases of the nervous system decidedly predominate, though there are also many papers on other questions. Finally, Dreschfeld's contributions to Clifford Allbutt's *System of Medicine* must be mentioned, viz., the articles on "Infective Endocarditis," "Enteric Fever," "Ulcer of the Stomach and Duodenum," and on "Endocarditis."

Dr. Robert Maguire, who was Dreschfeld's assistant in his pathological work in his earliest days, writes:—

"Dreschfeld's most original piece of scientific work was never published. If it had been pursued it would have been of the utmost importance. In 1882—1883 there was an outburst of hydrophobia in Manchester, several deaths occurring in the Infirmary and others outside. Altogether it fell to Dr. Dreschfeld's demonstrator to make about ten autopsies. Pasteur had then said nothing about hydrophobia. He had just published his work on the "Intensification" and then the "Diminution" of the anthrax poison which led to his results on "Immunisation." Dreschfeld had the idea that the same might be done with hydrophobia, and set to work on the question. The whole of Pasteur's work on the intensification of hydrophobia poisoning by passage through rodents was done at Owens College before a word came from Paris, and this was Dreschfeld's work. At first it took three weeks to kill a rabbit by inoculating it with saliva or blood, but at last a poison was obtained which would kill a rabbit in 12 hours. Dreschfeld had the idea that the

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poison lay in the spinal cord, and therefore he kept the spinal cords for some time, and up to a few years ago they were still in the laboratory, and the experiments were recorded in the laboratory book. He proposed that after keeping the cords an emulsion of them should be made and injected into dogs to see if the poison had changed in virulence. Thus was Pasteur's work very closely foreshadowed, but the Vivisection Act of that date stopped the experiments.

" Thanks really to Dreschfeld Manchester has been better informed of Continental work than any other place in the Kingdom. When he was Assistant Physician he read Kussmaul's observations on lavage of the stomach, and set to work to carry them out for himself. In doing this he forestalled by ten years an eminent and prominent London Physician who took up the same subject and used the method very largely in his practice. This constant study of Continental progress gave Dreschfeld too little time for original thought. For instance, about 1884 he did some work on " wandering " pneumonia. He believed that the pneumonia was infectious, but more recent observations have shown that the pneumonia followed some previous infection not then so well understood as is influenza at the present day. Dreschfeld's observations on these cases were most accurate and his descriptions show that he was dealing with the first instances of the then new influenza, but he did not see this, his ideas being prepossessed by the observations of Kussmaul who had worked on similar lines."

" His first course of lectures in pathology, like many of those which followed, was not " compulsory." It was attended by two students, one of whom had to leave at the half-hour to attend another lecture. Dreschfeld told me that he always entered the room with fear lest the one man who remained the whole hour should be kept away by some cause, and the lecture be therefore stopped at half-time, for want of an audience. This, however, never happened."

Whilst Dreschfeld by his work as a physician and teacher secured the gratitude of his contemporaries, and by his writings a world-wide fame, one paramount service which he rendered to the University to which he was attached, and to medicine

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in England in general, deserves special acknowledgment. This is that he was the first at any English medical school to teach systematically pathology and pathological histology, and to secure to these branches of medical knowledge the important rôle which they now possess and ought to possess in the medical curriculum. Not only was Dreschfeld, when appointed in 1882, the first professor of pathology at the Owens College, he was the first professor of pathology in England, for the chair of pathology in Cambridge—(We are indebted to Prof. Woodhead for this information)—was established by Grace on December 6th, 1883, and the first professor was appointed there in 1884. Thus Cambridge was the first university in England to follow the example set by Manchester.

What the state of affairs in regard to the study and teaching of pathology was at this time was aptly and with great moderation put forward by Dreschfeld in his opening address at the Annual Meeting of the British Medical Association in 1886. "Whilst fully admitting," he said, "the vast amount of pathological work done in England, one cannot help feeling that still more would be done, if we had institutes like those on the Continent, and if pathology entered more largely into the curriculum of our medical study. . . . . At present we miss systematic instruction in pathology, the lectures are insufficient in numbers, the teaching in the post-mortem rooms is often left to inexperienced demonstrators. . . . . There is no separate examination for the various diplomas and degrees" . . . . excepting "the University of Cambridge, which has recently established an endowed chair of pathology, and gives due weight to pathology in the medical examination, and the Victoria University, where separate examinations are held, both in general pathology and in pathological anatomy, and where the candidate for the degree has to bring proofs of having studied pathology practically in a laboratory."

(Even in Cambridge, though the professorship in pathology was instituted in 1884, "the examination in special and general pathology which was commenced at the time was conducted in connection with the examination in medicine, but in June, 1898, a special examination in general pathology was instituted, the

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special pathology examination still being carried on in connection with the medicine and surgery examination."—Professor Woodhead.)

It was no doubt due to the exertions of Dreschfeld that this most necessary reform was introduced at the Victoria University, and the example here set followed by other examining boards throughout the kingdom. For those who have studied on the Continent and for the younger generation, it is difficult to realise that the inclusion of pathology as an essential and important part of the medical curriculum should be of such recent date, a reform which within so short a time has contributed largely to the establishment of schools of pathology in England equal to any in the world.

Whilst these were perhaps the main results of Dreschfeld's work as regards the larger medical world, it is almost needless to enlarge upon his more immediate influence on his pupils and his colleagues.

As a teacher or lecturer he was characterised by his wide reading, wonderful memory, vast clinical experience and clear thinking. His classes, lectures, and addresses were all models of lucidity, and were delivered with a facility which showed perfect acquaintance with his subject, and which made difficult problems seem so easy and straightforward to every member of his audience. Any subject which engaged his attention was discussed in great detail, and whilst it may be said with perfect truth that average students require more instruction in broad principles than Dreschfeld was in the habit of giving, it cannot be denied that such a training in the importance of details, as was received in his ward classes or lectures, was a most valuable preparation for future practice.

Dreschfeld impressed students and medical men by his wonderful memory for the smallest details of his previous scientific or clinical experience. He probably never forgot any case which had interested him, and he could recall such cases years afterwards, when he wanted to illustrate a lecture. He also had a fluent knowledge of French and German as well as of English, was an omnivorous reader of medical literature and possessed the power of picking out the most valuable observations which he stored away in his memory and incorporated in his notes for lectures or ward classes.

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There is no doubt that the example he set as an arduous, patient and consistent worker, as a most able and still most painstaking and conscientious physician was of the greatest influence to all who came in contact with him. Few medical men indeed there can be in this district who have not learned from him; every consultation was an object lesson in pathology and medicine. Added to this there came his charming modesty, so that even the humblest practitioner felt he was meeting merely a colleague and not the renowned professor.

Of Dreschfeld's private life there is little to say. His time was so fully taken up with the exercise of his profession, his duties as a teacher and his literary work, that there was no room left for other interests. Apart from his fondness for music he had no hobbies. In conversation, even with his most intimate friends, no other than medical subjects could engage his attention for a prolonged time.

He was, above all, a splendid example of an indefatigable worker. Hurrying from consultation to consultation, one railway journey after another, in cold, fog or rain, returning home late in the evening, he would still settle down to literary work often until early morning hours; thus he would forget the toil of the preceding day and not think of the probable hard work of the next. To Dreschfeld his work was everything. Personal comforts he utterly disregarded; the calls of his family or of friendship were also brushed aside when there was work to do, and he even would not give in to the demands for more bodily and mental rest which his failing health during later years must have made more or less urgent. Thus to the end! His mind being perfectly clear, he was, only a few hours before his death, planning out more work and speaking of the experimental researches which he intended to make in regard to the digestion of different foods in the stomach in health and in disease, a subject which he thought of choosing for the Lumleian Lectures; but he felt his increasing weakness, and almost his last words to a friend were: "I am afraid I shall never do it; but never mind, I have done my share; I have had my innings, and a good innings it has been, and I have enjoyed it; let others follow on!" Calmly and contentedly he looked death in the face—swift, painless and sudden the end came. "I feel better, I shall sleep to-night," were his last words.

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SOME MALFORMATIONS OF THE HUMAN HEART.

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and

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THE inclusion of a paper dealing with facts which, at present, seem to have little practical bearing, in a volume devoted to the memory of the late Professor Dreschfeld requires no apology, for all who knew him, as we knew him, are aware that he extended the utmost sympathy and support to those who were working with the object of increasing scientific knowledge. He saw clearly that advances could only be made in medicine, as in other sciences, by the accumulation and digestion of facts, remembering that such facts, though apparently useless to-day, frequently become the working capital of to-morrow. We have therefore no hesitation in including in this volume a record of a series of observations which, with others of a similar character, are, we believe, tending towards the solution of some interesting questions with regard to the development of the heart, the elucidation of which may lead to a better appreciation of the peculiarities and capabilities of the organ.

We intend, however, at present merely to register our observations on some interesting malformations, without discussing at any length their bearing on developmental problems; in a future communication we propose to deal with these problems at greater length. The anomalies we record are interesting, both from a clinical point of view, so far as their histories are known, as well as from a pathological and an embryological standpoint, from the latter standpoint in particular, because of their suggestiveness with regard to some obscure points in the development of the organ.

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Description of the Specimens.

Case I. Complete absence of the inter-ventricular septum.

This specimen, which occurred in an apparently healthy man of 35 years of age, is, on account of the age of the patient, almost unique. It has already been described by one of ourselves,[1] and we only reproduce an illustration which shows its most salient features; briefly, these are as follows:—There is only a single ventricle. The inter-ventricular septum (septum inferius) is hardly distinguishable; a small ridge, little more than a well-developed "columna carneæ," is the only representative of the septum. The ventricle, however, is partly divided by an infundibulo-ventricular band into two cavities. The aorta and the pulmonary are transposed.

Case II. Complete obliteration of the stem of the pulmonary artery. Patent ductus arteriosus from which the right and left pulmonary arteries arise. Imperfect inter-ventricular septum. Patent foramen ovale, etc., in a female child, aged 2½ years.

For the clinical history of this case we are indebted to Dr. Lapage, and for permission to examine and report upon the specimen to Dr. Ashby, who, with his usual kind courtesy, placed it entirely at our disposal.

The patient was first seen by Dr. Lapage when she was two years old. At that time she was fairly well nourished, she was distinctly cyanotic, the extremities of her fingers were clubbed and the external ears showed marked signs of lobulation, a condition which Dr. Ashby finds is not uncommonly associated with imperfect development of the heart. On further examination a loud systolic murmur could be heard over the greater part of the chest, and it was particularly marked to the right of the middle line. When the child reached two and a half years she was seized with broncho-pneumonia, and was sent as an in-patient to the Pendlebury Hospital, where she came under Dr. Ashby's observation, and where she subsequently died.

1. Young, A. H. "Rare Anomaly of the Human Heart: a three-chambered Heart in an Adult, aged 35 years." *Journal of Anatomy and Physiology*, vol. xli., p. 190.

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When the heart was removed at the post-mortem examination it showed signs of general hypertrophy, especially as regards the left ventricle. The veins were unfortunately cut very short, and one or two points in the anatomy of the auricles are therefore less clear than we could desire.

Auricles. Right Auricle. In the removal of the heart a portion of the wall of the auricle was removed, and no trace of the superior vena cava could be found, but from the general appearance of the specimen we doubt if it was ever developed. There is also no definite interior vena cava, but along the line of union of the auricle and the sinus venosus there is a remnant of a Eustachian valve running towards but not reaching the anterior limb of the annulus ovalis. The sinus venosus is prolonged to the left round the back of the lower part of the left auricle; that is, the original left cornu still exists, and has not been reduced to a coronary sinus. This cornu receives, at its left extremity, a large left superior vena cava which descends obliquely from left to right and from above downwards across the posterior wall of the left auricle. On the septal wall of the auricle in front of the left cornu of the sinus venosus, and separated from the latter by a distinct muscular ridge, is a deep pit-like fossa ovalis (Fig. 2), in the anterior part of which there is a small opening of communication with the left auricle. Immediately behind the ridge which separates the fossa ovalis from the left cornu of the sinus venosus there is a second communicating orifice between the two auricles (Fig. 2) through the lower part of the inter-auricular septum.

Left Auricle. The walls of the left auricle are comparatively thin and the cavity is divided into right-posterior and left-anterior portions by a deep ridge, which corresponds externally with the deep sulcus in which the left superior vena cava lies, and by the projecting floor of the fossa ovalis. The anterior portion communicates with the right auricle in the region of the fossa ovalis, and the margins of the communicating aperture on the left side are situated between radiating muscular bundles similar to those which are so often met with in this region. Towards the left the anterior part of the body of the auricle is prolonged into the auricular appendix.

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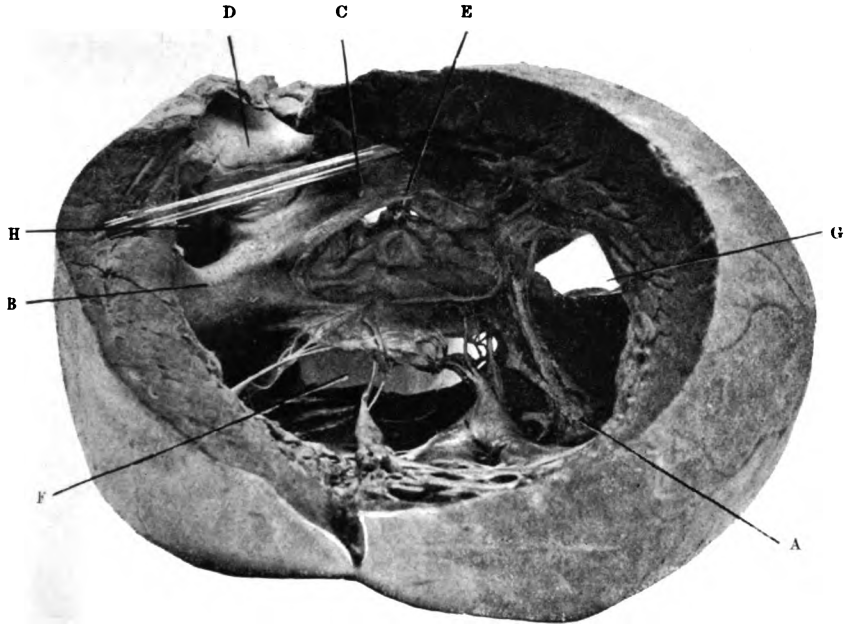

FIG. 1.—The cavity of the common ventricle (from a photograph by Messrs. Flatters & Garnett, Manchester). Part of the anterior wall of the ventricle has been removed and the ventricle opened out laterally; a glass rod is inserted to keep the cavity open.

A, septum inferius (interventricular septum); B and C, parts of infundibulo-ventricular ridge; D, aorta; E, orifice of the pulmonary artery; F, right auriculo-ventricular aperture and tricuspid valve; G, left auriculo-ventricular aperture and mitral valve; H, remains of the infundibular part of the right ventricle, previously described as the remains of the bulbus cordis.

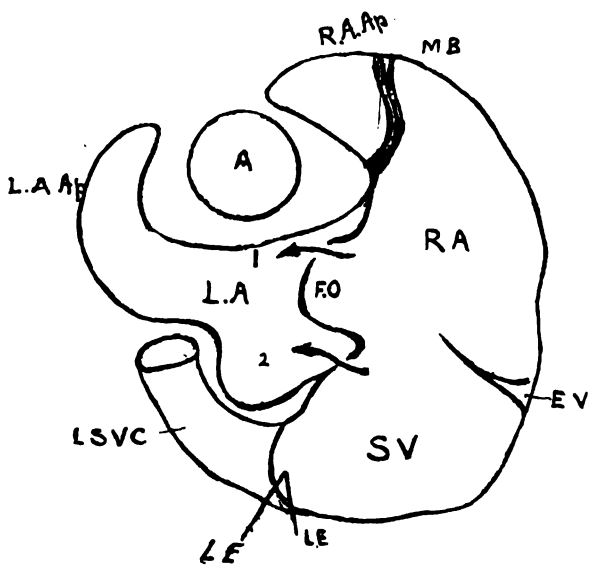

FIG. 2.—Horizontal Section through the auricular part of the Heart of Case II. (Diagrammatic).

A Aorta.
EV Eustachian valve.
FO Fossa ovalis.
LA Left Auricle.
1. Anterior part.
2. Posterior part.
LAAp Left auricular appendix.
LE Left extension of sinus venosus, or left cornu.
LSVC Left superior vena cava.
MB Moderator band in right auricle.
RA Right auricle.
SV Sinus venosus.

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The right and posterior part of the cavity is somewhat sac-like in form; it communicates with the left extension of the sinus venosus by the aperture previously mentioned, and it receives the four pulmonary veins.

The Ventricles. Right Ventricle. Only the inferior part of this cavity is visible when the ventricular part of the heart is opened from the right side, that is, there is no conus arteriosus or infundibulum. The right auriculo-ventricular valve has only two cusps—the marginal and the septal. The walls are thick, but not so thick as those of the left ventricle, and the cavity opens into the cavity of the left ventricle through a large aperture which occupies the greater part of the situation of the pars membranacea septi. This opening, in the erect posture, lies below and slightly to the left of the aortic orifice (Fig. 3), and from its inferior margin which is adjacent to the right margins of the cusps of the left auriculo-ventricular valve a papillary muscle springs and is connected with the margins of the valve cusps by chordæ tendineæ.

Left Ventricle. The walls of the left ventricle are very thick, and its cavity is separated into two unequal parts by a muscular ridge which commences at one extremity immediately below the interval between the right and left posterior cusps of the aortic valve (Fig. 3), and at that point is continuous with the antero-superior boundary of the opening in the inter-ventricular septum. From this commencement it curves forwards and upwards, and terminates, above, opposite the angle between the anterior and the left posterior cusps of the aortic valve. As a whole, the ridge projects from the very thick upper part of the anterior wall of the left ventricle upwards and to the left into the cavity of the ventricle, and to the right and in front of it there lies a small but distinct segment of the cavity. This segment of the cavity of the left ventricle lies immediately below the right two-thirds of the aortic orifice, the remaining third of that orifice being above the opening in the inter-ventricular septum and the cavity of the larger segment of the left ventricle. We look upon the smaller right segment of the cavity of the left ventricle of this specimen as the representative of the infundibulum, and we

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propose to call the ridge which separates it from the remainder of the cavity the infundibulo-ventricular ridge.

The Pulmonary Arteries. The pulmonary arteries do not communicate with the cavity of either ventricle. The stem of the pulmonary artery is only represented by a fibrous cord which is connected below with the left side of the commencement of the aorta and above with the lower wall of the right pulmonary artery to the right of the ductus arteriosus, therefore in this specimen that portion of the aortic bulb which usually becomes the stem of the pulmonary artery has been transformed into a thin impervious fibrous cord.

The right and the left pulmonary arteries spring from the patent ductus arteriosus through which they received blood from the aortic arch.

The Aorta. The aorta is the only blood-vessel which carried blood from the heart. It springs from the upper right and front angle of the left ventricle, and more particularly from the smaller right segment, and therefore chiefly from the segment which normally should have become the infundibulum of the right ventricle. A portion of the aortic aperture is, however, situated over the cavity of the left ventricle proper, nevertheless, lying mainly over what we believe should have been the infundibular portion of the right ventricle, it is, in our opinion, transposed, and this idea is confirmed by the termination of the fibrous remnant of the stem of the pulmonary artery on the left of the commencement of the aorta.

Remarks on Case II. In this most interesting case, as we interpret it, a left superior vena cava is present following the course of the oblique vein of Marshall and opening into the dilated left extremity of the primitive sinus venosus. The inter-auricular septum is pervious at two separate points. The cavity of the body of the left auricle is separated into two loculi by the pressure of the left superior vena cava on its posterior wall. The infundibular portion of the right ventricle is separated off from that cavity and incorporated with the left ventricle. The inter-ventricular septum is incomplete. There has been a transposition of the aorta and the stem of the pulmonary artery, and the latter has atrophied to a fibrous cord. The blood sent

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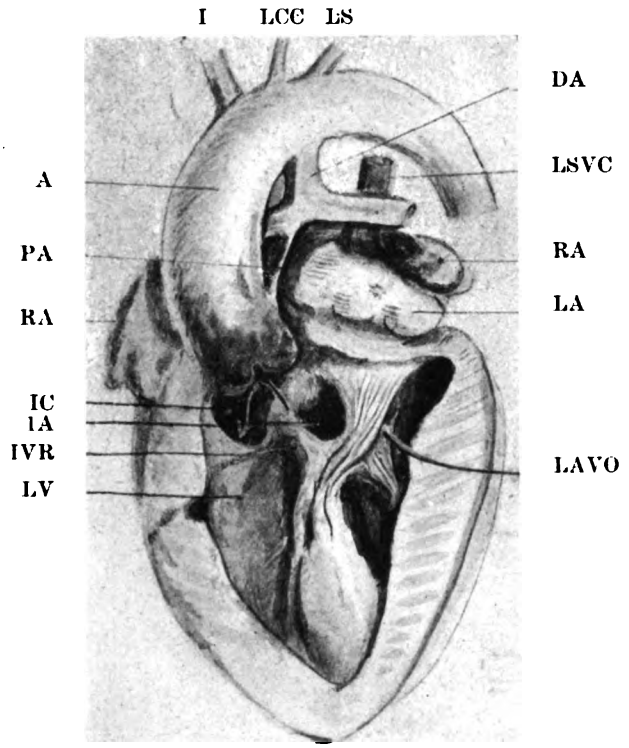
FIG. 3.



General view of the heart in Case II., showing the obliterated and transposed stem of the pulmonary artery, the patent ductus arteriosus, the right and left pulmonary arteries, and the left superior vena cava. The left ventricle has been freely opened, and shows the interventricular system and its deficiency; the aperture leading to the infundibular cavity, the orifice of the aorta, and the infundibulo ventricular ridge are also seen.

A Aorta.
DA Ductus arteriosus.
I Innominale artery.
IA Interventricular deficiency.
IC Infundibular cavity.
LVR Infundibulo-ventricular ridge.
LA Left auricle.
LAVO Left auriculo ventricular orifice.
LCC Left common carotid artery.
LS Left subclavian artery.
LSVC Left superior vena cava.
LV Left ventricle.
PA Pulmonary artery (obliterated).
RA Right auricle.

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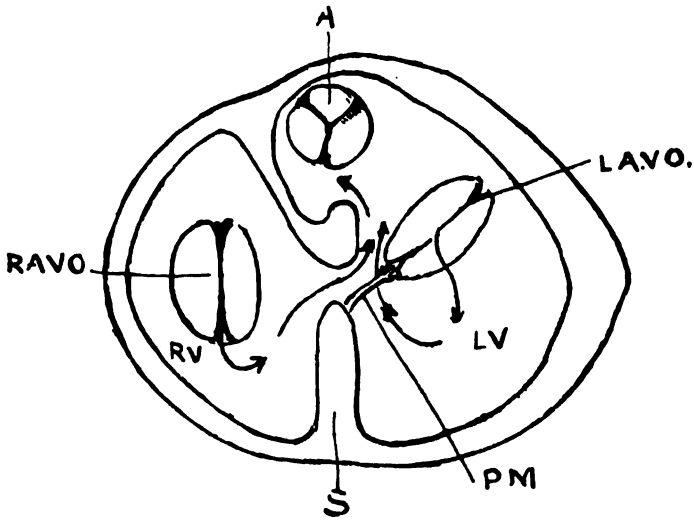

FIG. 4.—Vertical Transverse Section through ventricular part of heart of Case II. (diagrammatic). Seen from the front.

A Aorta.
LAVO Left auriculo-ventricular aperture.
LV Left ventricle.
PM Papillary muscle.
S Septum.
RAVO Right auriculo-ventricular aperture.
RV Right ventricle.

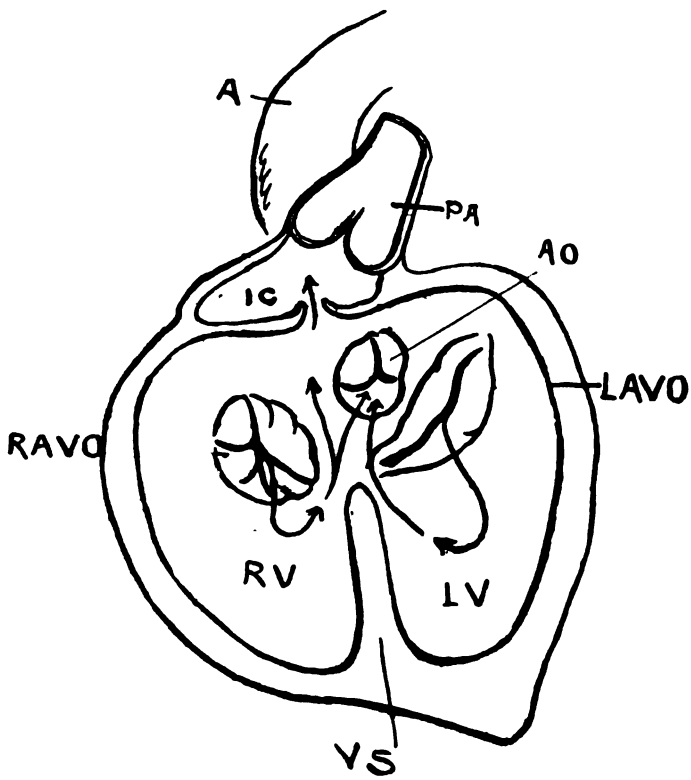

FIG. 5.—Diagrammatic view of the Ventricles of Case III.

A Aorta.
AO Aortic orifice.
IC Infundibular cavity.
LAVO Left auriculo-ventricular orifice.
LV Left ventricle.
RAVO Right auriculo-ventricular orifice.
RV Right ventricle.
VS Interventricular septum.

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to the lungs during life must have passed from the left ventricle by the aorta and thence through the pervious ductus arteriosus from which the right and left pulmonary arteries arise. The dorsal part of the left fifth aortic arch, which usually atrophies, has remained widely open, and forms the channel of communication with the right and left pulmonary arteries into which the ventral part of the fifth left arch and adjacent parts of the apex of the aortic bulb and the fifth right arch have been incorporated, whilst the segment of the aortic bulb which should have become the stem of the pulmonary artery has been obliterated.

During life blood was carried to the right auricle most probably by an inferior vena cava and a left superior vena cava, the latter being the persistent left duct of Cuvier. From the right auricle the major part of the blood passed into the right ventricle and the minor part through the inter-auricular foramina into the left auricle. From the right ventricle the blood was projected through the inter-ventricular foramen into the left ventricle, meeting, on its entrance, with the blood of that cavity together with which it passed into the aorta, the blood of the left ventricle being mainly oxygenated blood returned to the left auricle from the lungs, but with a slight admixture of venous blood which traversed the inter-auricular foramina. The blood in the aorta, therefore, was mixed blood, some of which was distributed to the head and neck, some to the body and limbs, and some passed by the ductus arteriosus into the right and left pulmonary arteries and thence to the lungs and left auricle.

CASE III. Communication between the right and left ventricles through an inter-ventricular foramen. The infundibulum almost entirely separated from the ventricles.

We are indebted for this specimen to Dr. Emanuel, of Birmingham. It was taken from a boy aged 7 years, whose fingers and toes were clubbed, and who died with signs of cardiac failure and general anasarca after exhibiting marked cyanosis during life. The heart had undergone general hypertrophy, but the hypertrophy was most marked in the region of the right ventricle.

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The Auricles. The auricles communicated with each other by a well-marked inter-auricular foramen situated at the upper and anterior part of the fossa ovalis. On the left side this aperture was situated between two small but distinct muscular bands. In all other respects the auricles were quite normal.

The Ventricles. The ventricles are greatly enlarged, both as regards the size of their cavities and the thickness of their walls; this excentric hypertrophy is noticeably more marked in the right than in the left ventricle.

Right Ventricle. The right auriculo-ventricular orifice is guarded by five cusps instead of the usual three; three of the five are subdivisions of the right or marginal cusp, and they receive chordæ tendineæ from the musculi papillares of the inferior and septal walls. The moderator band is short and very thick. To the left of the infundibular cusp of the right auriculo-ventricular aperture there is a large opening in the upper part of the inter-ventricular septum, in the situation usually occupied by the anterior part of the pars membranacea septi, and immediately above this inter-ventricular opening is the orifice of the aorta which lies partly over the right and partly over the left ventricle. Above and in front of the inter-ventricular foramen, and separated from it by a prominent muscular band, is a small aperture which forms the only means of communication between the body of the right ventricle and the remains of the infundibulum. The margin of the aperture is formed by a firm and, in the hardened specimen, inextensile fibrous band; in the outer periphery of this band numerous chordæ tendineæ are attached which are connected with columnæ carneæ on the anterior wall of the ventricle. The infundibulum is a relatively small somewhat conical-shaped cavity, possessing an anterior and a posterior, a right and a left lateral wall. The anterior and posterior walls meet below, forming a narrow sulcus. In the floor of this sulcus, near its anterior and left extremity is the small aperture of communication with the body of the right ventricle. The opening of the pulmonary artery is in the left lateral wall of the infundibulum, two of the cusps of the pulmonary valve being in front and one behind. The walls of the infundibulum are muscular but relatively thin.

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Left Ventricle. Although the left ventricle is hypertrophied it is relatively small as contrasted with the right ventricle. Its cavity communicates with the auricle in the usual way, and the mitral valve is normal. The right and anterior part of its cavity is more dilated than usual, and it communicates with the right ventricle through the inter-ventricular foramen, and the aortic orifice is situated at its upper end.

The Pulmonary Arteries. The stem of the pulmonary artery springs from the left of the small and almost isolated infundibular cavity. It is of considerable size, but its walls are thin; it divides in the usual way into right and left branches, and neither the stem nor its branches have any communication with the aorta, for the ductus arteriosus is completely obliterated. The pulmonary valve consists of three cusps, two of which are placed anteriorly and one posteriorly.

The Aorta. The aorta springs partly from both ventricles, its orifice being situated over the inter-ventricular foramen, but more to the left than to the right of the margin of that orifice. The two cusps of the aortic valve are placed one anteriorly and the other posteriorly. The arch of the aorta and part of the descending thoracic aorta are still attached to the specimen. In the arch the position of the opening of the ductus arteriosus is marked by a small cicatrix, and an examination of the descending aorta shows that neither the bronchial nor the aortic inter-costal arteries are larger than usual, from which it may be inferred that no extra amount of blood passed to the lungs through these channels.

The Veins. The venæ cavæ and the pulmonary veins are normal in number, size and appearance.

The Circulation. The circulation must have been carried on in much the usual way, except that a part of the blood from the right ventricle passed directly into the aorta.

It is difficult to understand, from an examination of the hardened specimen, how the amount of blood necessary for the pulmonary circulation, as indicated by the size of the pulmonary artery and pulmonary veins, could have passed through the small and apparently undilatable orifice by which the right

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ventricle communicated with the infundibulum. It is possible that during life the margin of the orifice was more extensile than now, and this possibility appears to receive support from the connection of the columnæ carneæ with the periphery of the fibrous ring by which the orifice is bounded.

CASE IV. Cavities of the right and left ventricles continuous. Inter-ventricular septum practically absent. Infundibular chamber very largely separated from the remainder of the ventricular cavity by a well-formed infundibulo-ventricular septum. Transposition of the aorta and pulmonary artery.

For this specimen also we are indebted to the kindness of Dr. Emanuel; it was taken from the body of a male child, aged twenty months in whom during life the only trace of cyanosis was a slight blueness of the lips. There was no clubbing of the fingers, but for some weeks before death, which was due to septic thrombosis of the pulmonary artery following pleurisy, there had been attacks of sudden exhaustion.

The heart is of about the usual size at this age, and except that the aorta and pulmonary artery appear to be transposed and that there are no inter-ventricular sulci its external appearance is normal.

The Auricles. In connection with these chambers nothing particular is noticeable except that the foramen ovale is completely closed and that the left auricle receives only one pulmonary vein on each side.

There are two chambers in the ventricular part of the heart—a large chamber which occupies the greater part of the interior and a much smaller space which occupies the position of the infundibulum of the normal heart. These two cavities communicate through a wide aperture situated at the upper part of the intervening septum and immediately below the posterior cusp of the aortic valve.

The smaller cavity, at its lower extremity, is a more or less cleft-like space which is situated just above the middle of the length of the ventricle, but it widens out above, and occupies an area equal to about two-thirds of that of the orifice of the aorta with which it is in direct continuity.

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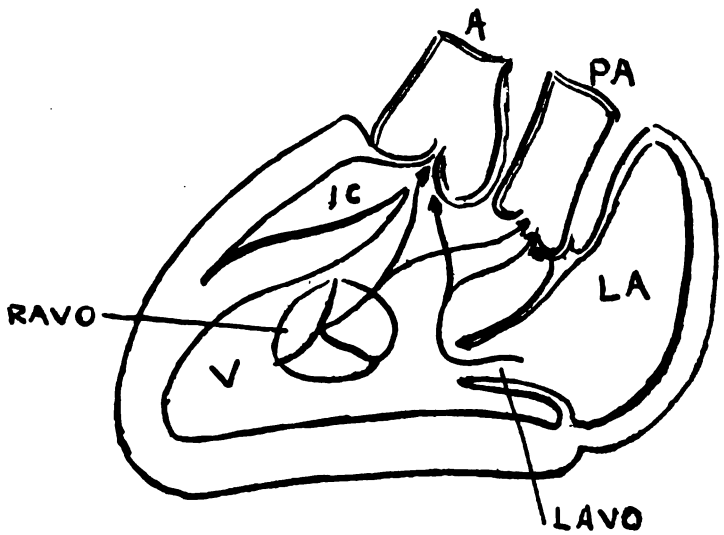
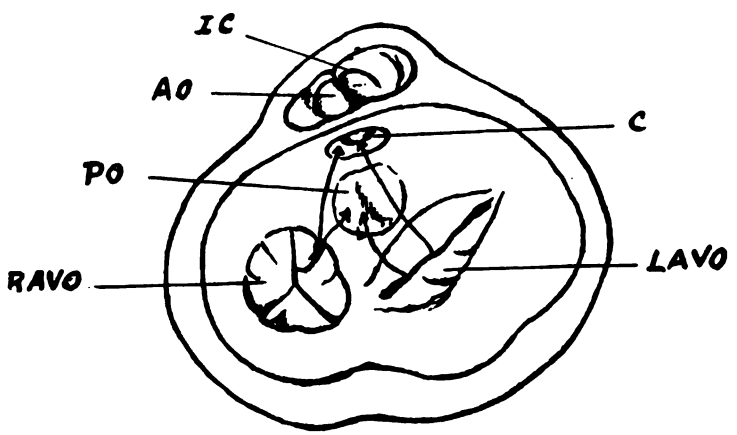
FIG. 6.



Sagittal section of the heart of Case IV. (diagrammatic).

A Aorta.
IC Infundibular cavity.
LA Left auricle.
LAVO Left auriculo ventricular orifice.
PA Pulmonary artery.
RAVO Right auriculo ventricular orifice.
V Ventricle.

FIG. 7.



Transverse section of the ventricular part of the Heart in Case IV. (diagrammatic.) Seen from the front.

AO Aortic orifice.
C Communication between infundibular cavity and ventricle.
IC Infundibular cavity.
LAOV Left auriculo-ventricular orifice.
PO Pulmonary orifice.
RAOV Right auriculo-ventricular orifice.

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The aortic orifice is guarded by three semi-lunar cusps of which two are placed anteriorly and one posteriorly, and the coronary arteries spring from the sinuses of Valsalva in association with the anterior cusps.

Remarks on Case IV. This case is practically, so far as the ventricular part of the heart is concerned, a more advanced stage of the same condition as that met with in Case i. It differs from it in the fact that the septum between the larger and smaller segments of the ventricular chamber is more complete and the aorta rises more definitely from the smaller chamber. So far as the circulation was concerned it is obvious that the venous and oxygenated blood were mixed in the larger ventricular cavity, and that the mixed blood was forced thence partly through the aperture between the two ventricular chambers into the aorta and partly into the pulmonary artery. Moreover it is obvious that the same ventricular force had freer play on the pulmonary than on the aortic orifice, therefore the pulmonary blood-pressure must at least have been equal to the systemic unless it was reduced by the contraction of the pulmonary orifice.

General Remarks.

We have grouped these cases together because in all the infundibular portion of the ventricular chamber tends to be separated to a greater or less extent from the other portions of the ventricular cavity. In Case iii. it communicates only with the right ventricle, but the latter communicates also with the left ventricle. In Case ii. it constitutes a small segment of the left ventricle, and is only defined from the latter by a muscular ridge. In Cases i. and iv. the greater part of the cavity of the right ventricle is blended with the cavity of the left ventricle, the normal inter-ventricular septum not being developed and the infundibular part of the right ventricle forms a distinct chamber which communicates with the larger cavity, but opens more directly into the aorta which in both cases occupies the position usually taken by the pulmonary artery.

The number of cases is not sufficient to form a basis for any definite opinions, but the occurrence of transposition of the aorta

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and pulmonary artery in three cases in which the infundibular part of the heart is more closely associated with the left than with the right ventricle is suggestive.

It is interesting also to note that although the hearts deviated so far from the normal condition still the abnormal condition was not in itself fatal, though no doubt in the last three cases it led to the death of the patient.

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NOTES ON SOME OF THE LESS FAMILIAR JOINT AFFECTIONS.

By G. A. WRIGHT, B.A., M.B. Oxon., F.R.C.S.
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IN a former paper (*Medical Chronicle*, July, 1906) the writer made suggestions as to the names and methods of grouping of Diseases of the Joints. In the present article it is proposed to give examples of a few forms of arthritis selected from among those which are perhaps most commonly misunderstood and wrongly named, and worse still, but consequently, wrongly treated. The errors are believed to be due in part to the habit of calling many different diseases Rheumatic or Rheumatoid without due investigation, and though it would be useful to enter into this subject in detail it is so intricate that its discussion has had to be postponed, and it is only proposed to relate examples of a few of the many forms of arthritis which have been, or are likely to be, thus misunderstood. In doing so no attempt is made at any thing more than illustration of those particular features which are likely to lead to misinterpretation. No complete description or record could be attempted, and the notes are meant to be merely suggestive of certain lines of enquiry which may usefully be pursued in doubtful cases of Arthritis.

An examination of some of the old specimens in any Pathological museum will show more or less good examples of distortion of the head of the femur and other bones with "eburnation," osteophytic outgrowths around the edges of the articulation and more or less formation of new bone either encrusting the adjoining area or developing in stalactite fashion in the attachments of neighbouring muscles and fibrous structures. Unfortunately these specimens have no clinical history and are simply labelled "Rheumatoid Arthritis" or some similar name.

That some of these conditions are the result of injury in the form of a single hurt of severe degree or of repeated slight strains or of constant over use in certain occupations is the view

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most strongly championed and most carefully worked out by Arbuthnot Lane. But though he refers to the occupations which produce certain of these lesions, we are not supplied with sufficient proof in the shape of clinical histories to make the evidence satisfying. On the other hand certain other lesions are found either in association with the more purely articular changes in the limbs or in the form of abnormal conditions of the spinal column, which are less credibly attributed also to the effects of labour. That a single severe injury may produce some of such conditions can hardly be disputed, and figs. (1) and (1A) shows such changes in the shoulder joint probably as the result of the fracture of the greater tuberosity of the humerus. Though the connection is less obvious, we may admit that the osseous growth in the structures not immediately adjoining the articulation may also be traumatic as such view is supported by analogous conditions found under other circumstances. It seems to be well established and is indeed familiar knowledge, that some of these lesions are traumatic, but it is much more doubtful whether Mr. Lane's view, that all the "Rheumatoid" and some of the other similar lesions are the result of injury, is a satisfactory one. If we examine specimens such as figs. ii.—viii. of the condition known as "Spondylitis deformans," and classed as one of the "Rheumatoid" changes, on the one hand, and as a traumatic condition on the other, it is difficult to believe that the bony deposit and the changes in the vertebræ are simply the result of injury, either on an isolated occasion or frequently repeated. The bony deposit, which has been well likened to a "guttering candle," does not suggest the conditions found elsewhere as the result of injury, but rather an ossification in a bulky soft effusion which has been rather rapidly poured out, and like a flow of lava has run down the spine and set or ossified as it descended.

Dr. Goldthwait (*Boston Med. and Surg. Jour.*, vols. CXLI. 1899 and CXLVI. 1902) has figured and described some good specimens, and gives photographs of patients said to be suffering from this condition, but we have no demonstration that the living patients had spines like those figured, nor have we any satisfactory account of the causation of the condition.

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Fig 1.—Upper end of humerus. The greater part of the head of the bone is missing. There is an old fracture of the greater tuberosity. The portion of head left shows eburnation and the effects of attrition.

Fig 1A.—Upper end of humerus. There is an old fracture of the greater tuberosity. There is some alteration in the form of the head with deposit of new bone.

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The link between the old museum specimens and the living patients whose history can be obtained is missing, and this discovery of the complete history with verification of the condition post-mortem would be a very valuable addition to our knowledge. Dr. Goldthwait does not record the result of X-ray examination of the spine in his cases. In one case of my own with symptoms closely resembling those of some of his patients, a skiagram did apparently show such bony changes together with atrophy of the bodies. An important, though, so far as I know, isolated, observation is that of Dr. MacCrae, that in a case of typhoid spine a radiogram showed bony thickening. On the other hand, C. J. Wilson quotes two cases in which radiograms were taken. In one nothing abnormal and in the other only weakening of the shadow was found.

Examination of specimens of Spondylitis suggest that the pathology of all cases is not the same, and it is certainly not improbable that in at least some instances the condition is due to one of the forms of systemic (bacterial or autotoxic) arthritis. Dr. Goldthwait mentions gonorrhœa, injury, cold, and various debilitating conditions, but does not dogmatise on the subject.

While writing the present notes, the kindness of my colleague, Dr. Wilkinson, has enabled me to see a case exactly in point. An ex-soldier, who had a history of a venereal sore and gonorrhœa, and who showed the scars of old buboes, was admitted to the Infirmary in December, 1907. Since leaving the army he had worked laboriously and in wet and cold, and had taken a great quantity of alcohol. For twelve months he had noticed a gradually increasing stiffness of his back, more especially in the cervical region and loins, with pain and disability. None of the joints of the limbs were affected, though there was aching pain in the thighs and upper arms, nor was the jaw stiff. On examination the man was sallow and looked ill. The whole spine was nearly absolutely rigid, except that the power of flexion of the head upon the atlas seemed free. Some thickening about the cervical spine appeared to be present on lateral palpation, and the region of the left sacro-iliac joint was swollen. The liver was enormously and smoothly enlarged. There was evidence of marked arterial degeneration. There

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was no ascites. An X-ray photograph, taken in an antero-posterior direction (Fig. ii. B) showed blurring of the outlines of the vertebræ, but a lateral view (Fig. ii. A) clearly displayed rounded smooth bosses on the anterior aspect of the vertebral bodies exactly like those in the figures. This appears to be a clear case of the condition described as spondylitis deformans, and, with the exception of the one already mentioned, is the first example I have seen of such a condition being illustrated by an X-ray photograph taken during life. The etiology of the disease is doubtful since many possible causes were present. Gonorrhœa, alcohol, exposure to wet and cold, ague and "low fever" in the West Indies, and perhaps syphilis, all figured in his previous medical history.

This man had no marked nervous affection. There was slight muscular wasting, and a certain amount of lateral curvature of the spine, with a tender spot at the level of the 6th cervical vertebra, but no evidence of tuberculous disease.

On the whole, it is probable that this condition, like many of the other forms of joint lesion labelled "rheumatoid," is either bacterial or autotoxic in origin.

Under the heading of acute local traumatic arthritis must at present be put perhaps that variety associated with hæmophilia, and as the subject is an interesting one some experience in regard to it may be mentioned here.

Hæmophilic arthritis or arthritis following upon an injury to a joint in a young person the subject of hæmophilia is, at its first occurrence, not more likely probably to produce any permanent joint lesion than is a hæmarthrosis in any other patient. It is rather the repeated hæmorrhages which produce the permanent changes found in a bleeder's joints. The condition, though of course not common, is not so rare as to be negligible, and it is so exceedingly likely to be overlooked, or rather mistaken for some other disease, that is it quite worth bearing in mind in any obscure or doubtful joint affection that may be met with. I have come across probably something like a dozen cases, and have notes or recollections of seven. It is of course highly probable that any bleeder will get, some time or other, an injury that will produce hæmarthrosis, and if this is

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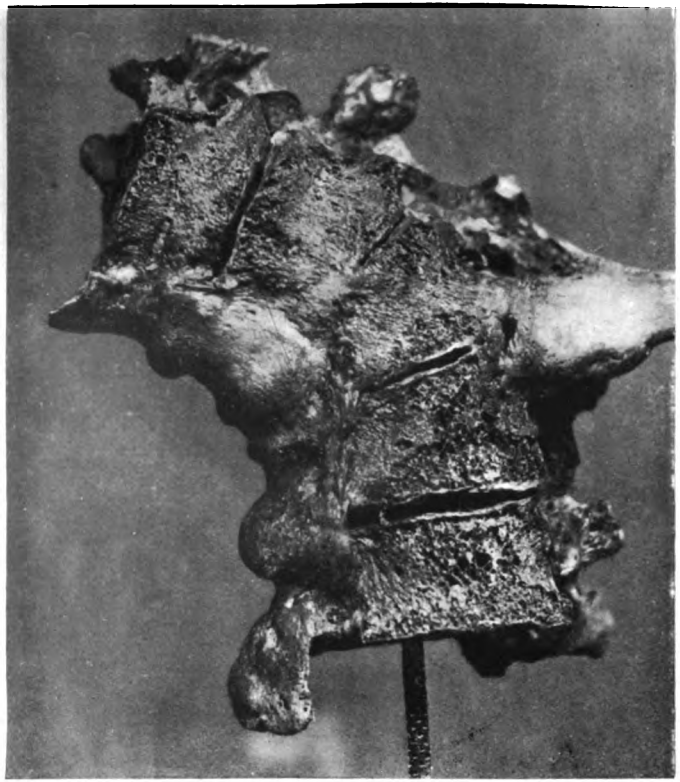

Fig. 2.—"Spondylitis deformans." The lava-like or guttering deposit of new bone cementing together the bodies is well seen. There is a marked lateral curvature.

Fig 2A.—Spondylitis deformans (lateral view) shows rounded bosses of new bone on the front of the vertebral bodies.

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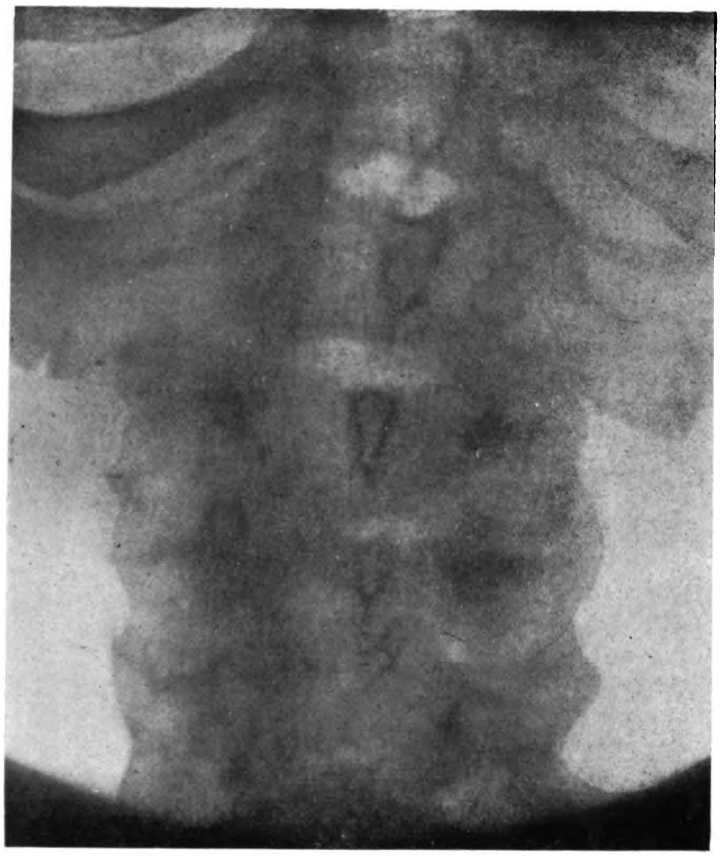

Fig 2B.—Spondylitis deformans showing bony deposit on the face of the cervical vertebræ.—Cf. Fig. 8.

Fig. 3.—An isolated boss of new bone sealing together two vertebral bodies.

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repeated certain definite changes in the joint are liable to be set up.

One of my earlier cases was that of one of two brothers, who were both markedly hæmophilic, though there did not appear to be any corresponding family history. When I first saw the boy he was 14 years old, and had sprained his left knee nine months before; at that time the joint filled with fluid and gave trouble off and on until I saw him. The joint was enormously distended with blood, and was in the condition of an acute hæmarthrosis. Twelve months later the boy was seen again. He was pale, and the joint was very painful. There was thickening, crackling and occasional slipping of the joint exactly like the condition found in certain joints labelled "rheumatoid arthritis." There was some slight shortening of the limb, perhaps due to interference with growth by the joint trouble. At the time of my first inspection the brother had an ankle joint half full of blood with discolouration like bruises around the part. I saw the knee again after another interval of a year, and found much deformity together with swelling. He had had a fall six weeks prior to my visit, and was then getting better. My notes say that eleven years later the joint was much deformed and crippled, and the seat of repeated attacks of an acute or subacute character, with pain and disability. He had had hæmorrhage into one elbow some three years before my last note.

In a man of 42, whom I saw in 1894, there was a family and personal history of bleeding. The left knee was well till twelve years before my inspection, when he injured it by a blow; pain lasted for a few days, but he did not rest it. Some twelve months later he had pain in the left hip "after sleeping in a damp bed." The knee never quite recovered, and recently had become worse; it was weak and painful, especially after he had been standing, and he had a feeling as of the joint giving way. He could not walk twenty yards. The other knee, one great toe and both elbows were in a corresponding condition.

Another instance was that of a child of 3½ years, whom I saw in April, 1901. There was a story of various bleedings since the age of three months. "The slightest blow always raises a bruise," I was told. In October, 1900, the knee was

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injured, and became swollen, and the swelling never quite subsided, though he was able to run about. On subsequent occasions, without any known injury, pain and swelling returned. When I examined him the joint was again full of fluid, but there did not seem to be any serious restriction of its use except during an attack.

Recently the following case has been under my notice :—

In June, 1907, a boy of 11 years (Terence C.) was sent into my wards suffering from a swollen and painful knee. At the first examination of the joint, though the appearance rather suggested tuberculosis, the mode of onset and one or two other features led to a careful enquiry in regard to hæmophilia. The boy's mother was alive and well. His father was alive, but suffered from periodic bleeding from the nose which was difficult to check. An elder brother died in youth from hæmorrhage after extraction of a tooth. Two sisters were alive and well. Since he was 5 years old the boy had had periodic attacks of swelling and pain in his knee occurring about twice a year. Each attack lasted about a fortnight. In the intervals he could run about and play football. On one occasion epistaxis and on another bleeding from a pimple lasted for a considerable time. No other joint had been affected. On this occasion pain and swelling came on suddenly, and on admission the joint was semi-flexed, though mobile through a fairly full range. There was slight thickening of the articular surfaces of the femur and tibia. Some muscular wasting was noticed. He improved rapidly under treatment, and was sent to the Convalescent Hospital on July 3rd. Early in September he was re-admitted with another attack. The joint was full of blood, and an X-ray photograph showed some irregularity in the outlines of both femur and tibia. The fact that in this instance the tendency was transmitted through the father's side is noteworthy.

It is important to bear in mind that tubercle occurs in bleeders, and in one instance I unwittingly erased a knee joint in such a boy. Happily he was not a severe case of hæmophilia, and recovered, though we had trouble with him. He also had caries of the spine with psoas abscess. In another lad whom I had opportunities of seeing occasionally a knee joint was affected,

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Fig. 4.—"Spondylitis deformans."

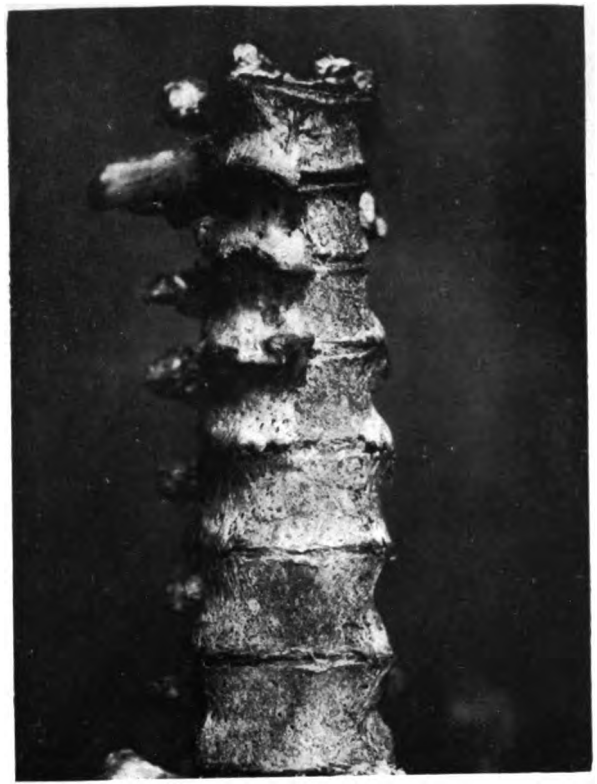

Fig. 5.—"Spondylitis deformans."

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Fig. 6.—"Spondylitis deformans." The bony deposit is less bulky than it is in some of the other specimens. There is a certain amount of antero-posterior curvature.

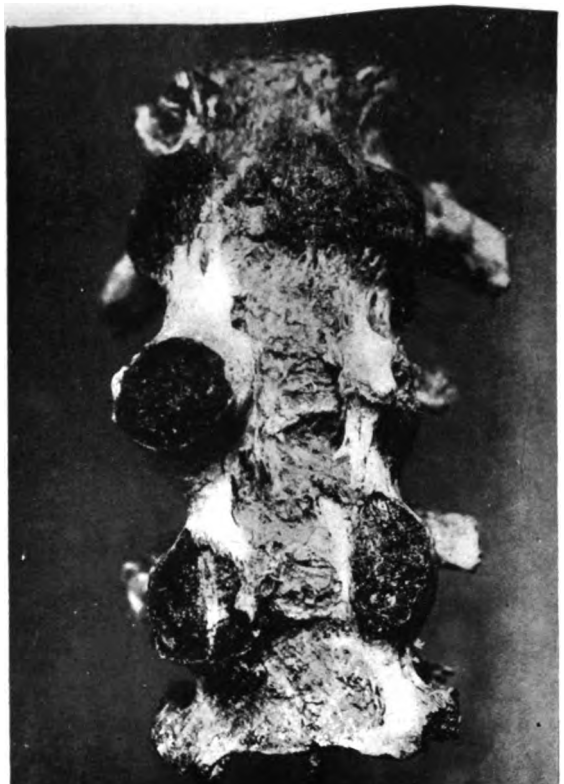

Fig. 7.—"Spondylitis deformans." The surface of some of the bosses is broken off, and the cancellous structure of the new bone is displayed.

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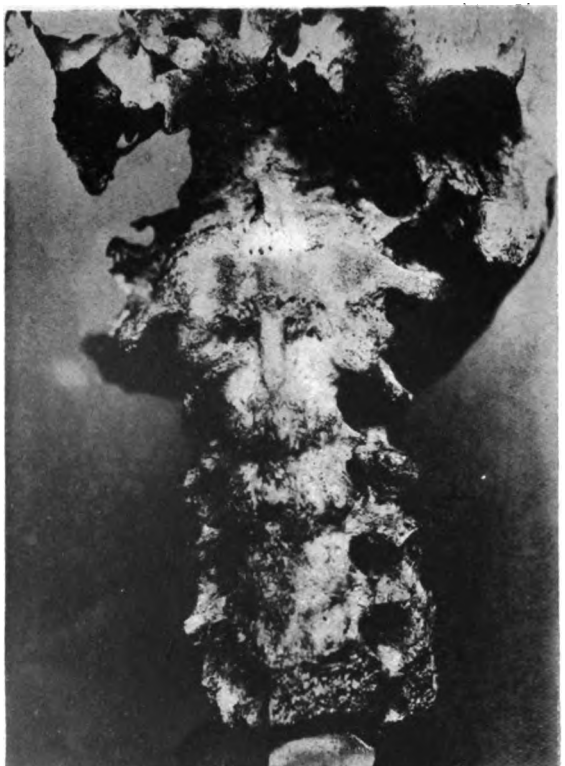

Fig. 8.—Spondylitis deformans of the cervical spine. The bony deposit is more diffuse than in some of the other specimens, and extends upwards to the skull.—Cf. Fig. 2B.

Fig. 9.—The acetabulum is altered in shape and surrounded by new bone. Stalactitic formation of bone has taken place around the obturator foramen and about the attachment of the hamstrings, etc.

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and he had, on one occasion at least, suffered from such severe hæmoptysis that he was almost moribund, and I was told that one lung was probably extensively injured by tubercle, though it is no doubt questionable how far the mischief may have been the direct effect of the hæmorrhage into the lung. Since the above was written he has died of exhaustion from long-continued epistaxis. It has been stated (Koenig) and denied (Froelich) that acute hæmophilic arthritis leads to chronic articular deformity. There is not the slightest doubt that it does so, and that the resulting condition closely resembles clinically the changes in so-called rheumatoid joints. This fact is an illustration of the importance of bearing in mind hæmarthrosis as a possible starting point of some of the lesions labelled "rheumatoid."

Marsh describes the wearing away of the cartilages with granular and fibroid degeneration and fissuring or loosening from the bone. At the same time, there may occur, he tells us, proliferation of the cartilage cells, which may escape into the cavity. These changes with weak ligaments, thickened synovial membranes and nodular excrescences from the bones are of course identical with the changes found in some forms of so-called "rheumatoid arthritis."

An interesting illustration of the effect of repeated traumatism is seen in cases operated upon for displaced semilunar cartilage of the knee or other loose body. If the attacks have been often repeated and the trouble is of long duration the secondary changes in the joint consist in thickening of the fringes, degeneration of articular cartilage and so on. Similar changes are seen in hallux valgus and in the joints of other toes similarly distorted by the pressure of ill-shaped boots, and such articulations afford striking examples of advanced "rheumatoid arthritis."

A single severe sprain of an inter-phalangeal joint will often give rise to precisely the conditions described as the "fusiform variety" of rheumatoid arthritis.

Pneumococcic arthritis is probably one of the commonest forms of suppurative arthritis, though we can only come to this conclusion as yet by comparing the clinical features of the

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instances in which the presence of the pneumococcus has been proved with those in which no investigation has been made. Thus scientific proof is wanting, but clinical evidence justifies us in believing that many of the cases of so-called "spontaneous" or "idiopathic" suppurative arthritis, and probably many of the acute epiphysary lesions are due to the pneumococcus. It is therefore likely that it is commoner in children than it would appear to be from the records. It is interesting to note that the character of the effusion into the joints appears to correspond to that of pneumococcic peritonitis.

Dudgeon and Branson's cases strongly suggest that the "acute suppurative arthritis of infants," first described by Sir T. Smith, is usually due to the pneumococcus. Its frequent association with pneumonia and the clinical records, though deficient in the essential bacteriological examination, certainly point in this direction. The acute bone lesions of older children appear to be usually staphylococcic, but it seems worth an enquiry whether the pneumococcus is not an important organism in them and possibly in many pyæmic conditions so called.

That influenza sometimes causes joint trouble is an established fact, but it is difficult to say how common the infection is since so many minor ailments are called influenzal, and we know that the real disease may produce lesions of so many kinds and in so many organs. My impression is that it more commonly causes mischief in bones than in joints, but I have seen a young man with polyarthritis of the larger joints causing pain, and stiffness and muscular wasting. The arthritis was recurrent, and the joints did not quite recover. No absolute rigidity and no bony thickening were present. No other cause for the trouble could be found, and he had never been well since his first attack of influenza, but the inflammation of the joints did not come on for a year after the acute illness, so the cause is doubtful.

Prof. H. Marsh (in his Bradshaw Lecture) records two cases of severe inflammation of the hip-joint coming on in one case during and in the other after influenza. Œdema and pain seem to have been the prominent features.

Wallis (*Brit. Med. Jour.*, January 3rd, 1903) records a case in which many joints were affected at the time of the attack, but

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the left knee alone remained troublesome, and anchylosis of the femur and tibia followed with fixation of the patella to the femur.

Dr. Murrell (*Lancet*, July 18th, 1903), relates a case of polyarthritis affecting the middle-sized joints occurring after repeated attacks of influenza, and refers to the possibility of pneumococcic arthritis and of some cases attributed to gout being influenzal.

I have seen three other cases in which the hip became inflamed during an attack of influenza, and in one suppuration occurred, but as pneumonia was also present the question is doubtful, and unfortunately the record of the case is deficient. Brief notes of one of the other cases (Maggie G.) are appended:

Bacterial Arthritis (Influenzal).

Maggie G., æt. 15, was admitted to the Infirmary on February 12th, 1900. In October, 1898, she had influenza, "leaving her with acute rheumatism" which kept her in bed sixteen weeks. Both hips, knees and ankles were inflamed. All the joints recovered except the left knee which remained stiff. She was treated at Buxton for nine weeks in 1899. When she was in the Manchester Infirmary there was considerable loss of mobility of the left knee with some thickening of the synovial membrane, but no heat or tenderness. The joint could be flexed, but not fully extended. Extension and subsequent fixation were employed.

The following brief records illustrate some of the other various forms of systemic (bacterial) arthritis :—

Gonorrhœal Arthritis.

Mark K., æt. 28, ex-soldier, was admitted to the Royal Infirmary in June, 1907. His health was good till 1900, when he was invalided after a long march in the South African campaign on account of "flat feet." The feet were tender and the ankles swollen. No other joints were affected, and his health was good. No history of gonorrhœa is admitted. He served in India, and returned home in 1904 when he was laid up with swollen feet and ankles. He has never been well since. Subsequently he admitted that a "gleet" had ceased three

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months before his admission to hospital. He had " remittent fever " in Rangoon in 1903. There was no syphilitic history. Three weeks before admission he suddenly fell ill, and then had pain in the left side followed by pain and swelling in the ankles, elbows, right shoulder, right sterno-clavicular and both temporo-maxillary joints. On admission, both plantar arches on both sides were tender and flattened. Both knee joints were distended with fluid, but beyond a sensation of weight were not painful. There was extreme tenderness in the right sterno-clavicular joint. Both temporo-maxillary joints were tender and swollen and painful on mastication. The teeth could not be separated more than $\frac{1}{2}$—$\frac{3}{4}$ inch. Pus containing numerous diplococci was found in the posterior part of the urethra. The prostate was tender on rectal examination. All the symptoms improved under treatment.

Bacterial Arthritis (Staphylococcic Arthritis from Carbuncle).

Abraham U., æt. 38, was admitted in July, 1907. He stated that he had had no serious illness till last March, when he had a carbuncle on the back of the neck, which was incised and healed in about a fortnight. Three or four days later his right thigh began to be swollen, an abscess formed and was opened. He then had very severe pain in the left hip. The pain was so great that he could not bear any movement or pressure. Three days later the hip joint was opened by an anterior incision. He remained in the hospital in his own neighbourhood for two months. The discharge has never ceased, and the leg has become shorter and stiff. On examination at the Royal Infirmary the left hip was found stiff, adducted, flexed and inverted with about $\frac{3}{4}$ in. shortening. A sinus over the front of the hip led to bare bone. The discharge from the sinus was found to contain staphylococci. On exploration the sinus was found to lead down to the lip of the acetabulum, but no direct communication with the joint was found.

In this instance the nature and source of the joint infection is obvious. There was a local staphylococcic infection of the skin and subcutaneous tissue causing the carbuncle and a subsequent invasion of the right thigh and left hip joint. In the

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latter the process was evidently a severe one leading to some destruction of bone.

Systemic Arthritis (Syphilitic).

Thomas B., æt. 32, ex-soldier. Seen May, 1907. In 1893 had Malta fever, later a chancre, but no secondary symptoms. In 1897 he had ague. For the last seven years has worked in Manchester, has had good health and has four healthy children. In May, 1906, the left ankle became swollen and painful, and at the same time a swelling appeared in the left parietal area. A month later the right shoulder and one ear became swollen and painful, and in August the left shoulder was attacked. A month before admission to hospital the right sterno-clavicular, left elbow and left knee joint were affected.

On examination, the liver and spleen were found to be slightly enlarged, otherwise the viscera were normal. Examination of the blood showed no abnormality. The pupils were unequal, but reacted naturally. The left ankle showed signs of old periarthritis with some stiffness, but no pain or grating. The left shoulder was in like condition. The right sterno-clavicular, left elbow and left knee joints were distended with fluid and very painful on the least touch or movement; the skin over them was hyperæmic, but not œdematous. The scalp over the left parietal area was adherent and thickened, with a definite raised margin to the swelling, which was very tender and constantly ached.

Under treatment by potassium iodide in doses increasing to 20 grains three times daily together with fixation of the joints of the limbs pain and swelling disappeared except from the sterno-clavicular joint, which was not immobilised. The symptoms tended to recur on movement or on ceasing to take the iodide. The gumma on the scalp subsided also and ceased to be tender or painful.

Notes by Dr. T. S. Harrison.

Autotoxic Arthritis.

In 1903 I saw, with Dr. Albrecht, a woman who had glandular abscesses in the neck in childhood, and in 1890 became anæmic and subject to neuralgia. In 1894 she began to have

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pains in the hands, and about the same time had pleurisy, followed a year later by influenza. About this time also the patient had swollen feet and sores on the legs. The ulcers healed, but broke out again six months before my inspection of her. In 1899 the left elbow became swollen and stiff. The hands have remained in much the same condition, and no other joints have been affected. When I saw her the range of movement in the left elbow was limited to about 40°. There was effusion into the left wrist joint and adjacent sheaths. In the right elbow there was evidence of slight thickening of the synovial fringes. The head of the first left metacarpal was thickened, and there was snapping and cracking in both knees on movement; there was no jaw trouble. The condition of the joints was unaffected by weather or exercise. Menstruation had been irregular and somewhat painful. She had not been pregnant, had not had leucorrhœa or any urinary or intestinal trouble, nor had there been any throat or ear affection. At the time that I saw her she had ulcers on the back of the calf with cutaneous varices. I saw her again in March, 1904. The ulcers had then healed, but the joints were getting worse.

How is such a case to be labelled? The length of time since her health first began to fail made it difficult to fix the sequence of the various troubles. My own belief is that the joint lesions were due to absorption, probably from the ulcers, possibly from the uterus, but I cannot prove it. No doubt the name "rheumatoid" would be applied by those who use the term. It is noteworthy that in this case the joints got worse, though the ulcers healed, but an established joint lesion does not always get well or remain stationary when the original cause is removed.

Autotoxic Arthritis (Uterine).

On the same day that I saw the last case I also saw a woman of 43, Mrs. L., who sixteen years before had borne her youngest child. She had not been pregnant for seven years previously. After a simple confinement she got up early and began to have trouble with the left knee, which was swollen and stiff. The right knee, right wrist, fingers and ankles became consecutively affected. When I saw her the left knee was anchylosed in good

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position, the right knee could be moved through 30° smoothly and was slightly flexed. The right wrist was stiff and the seat of periarticular swelling. There was fusiform swelling of the middle of the left index finger. Menstruation was frequent, and the joints were said to be always worse during her periods. It is interesting that this patient had seen many advisers, one of whom had proposed to open the left knee and promised a mobile joint as a result, while another equally eminent surgeon wished to fix the knee.

For cases of puerperal, menstrual and leucorrhœal arthritis—one of each—I may refer to a clinical lecture of my own, published in the *Lancet* for May 17th, 1902.

Autotoxic Arthritis (Puerperal).

Annie K., æt. 23, was admitted to the Royal Infirmary on March 17th, 1905. Her ailment began twelve months ago. She was confined and got up in a week; her labour was not a difficult one. A fortnight after her child was born she was suddenly taken ill with severe pains in the back, groins and down the legs to the feet. She was feverish, and her doctor "thought she had rheumatic fever." Menstruation has disappeared since her confinement. She did not suckle her baby. About five weeks ago some dark clots of blood were discharged from the uterus. She had night sweats and starting pains. On examination the right hip was flexed and stiff, and there was pain in the groin and knee and tenderness over the sacrum. There was thickening about the lower end of the right femur. There was no fever. The hip was manipulated under an anæsthetic, and she was discharged somewhat improved soon after.

Autotoxic Arthritis (Uterine, Leucorrhœal ? Bronchitic).

Matilda L., 35, married, was admitted to the Infirmary December 30th, 1903. Five years before admission she had a miscarriage, and has had leucorrhœa ever since. She has had no other pregnancy. Five months ago she had an attack of bronchitis, and was ill for a month. After being up for a week pain appeared in all her joints; the pain lasted two days and then disappeared from all the joints except the left knee which

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became swollen and so painful that she has not been able to use it since. The knee was found swollen, with thickening round the bones. It was excessively tender and 3½ inches larger in circumference than the fellow joint. Active movement was impossible, and passive too painful to be borne, but on attempting it a creaking sensation was felt. There was no constitutional disturbance. The left ankle was "dropped."

Massage and movement was the treatment adopted for the ankle and massage for the knee. A vaginal douche was used. She was sent to the Convalescent Hospital early in February. The swelling of the left knee had decreased, but it was still 1¼ in. larger than the other and still very painful on any attempt at movement.

This patient was a delicate woman "subject to asthma and a weak heart." It is doubtful whether the joint affection was due to absorption from the bronchial mucous membrane or from the uterus; its onset suggests the former, its persistence the latter.

From notes by Dr. Ollerenshaw.

Autotoxic Arthritis in a Tuberculous Patient.

Louisa B., æt. 24, single, was in the Infirmary in October, 1903. She gave a family history of tuberculosis, and was herself in the Children's Hospital for peritonitis, probably of tuberculous nature, when she was 7 years old. She has always been delicate. She has never menstruated, but has slight leucorrhœa of unknown duration. She has had a "swollen throat," but no serious illness except her joint mischief. About four years ago the knees began to swell and have been increasing in size ever since. About the same time the elbows began to get stiff. Some four months ago the wrists became swollen, and her neck began to get stiff three months ago. For the past few months there has been pain in the neck and knees each month; the pain lasts two or three days, and then disappears for a month when it recurs for two or three days, and so on. Until this time she had no pain, and apart from this she has had no indication of the menses.

On examination, both elbows are stiff as regards flexion and extension, but pronation and supination are free. Both knees

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are full of fluid; the left measures 14 in., the right 13½ in. in circumference. Both joints are in extension, but freely mobile without pain, but fine crackling is present on movement. There is no obvious bony change. The joints have been painful for six months. There is slight fulness of the left ankle. The muscles of both legs are wasted, and both are slightly swollen. The hips appear healthy. The left wrist is swollen and crackles on movement, which is painful, but not much restricted. The right wrist has more limited movement, but is otherwise like the left. Both elbows are anchylosed in a flexed position, though pronation and supination are free. It appears that the first sign of the elbow troubles was painless stiffness without swelling, which did not appear till between one and two years later, while in the knees swelling was the first sign noticed. While she was in Hospital about 2 oz. of serous fluid were withdrawn from the right knee by aspiration, and on examination microscopically and by cultivation by Dr. Sidebotham no organisms were found. Unfortunately after ten days' stay the patient contracted scarlet fever of which there an an outbreak in the ward at the time, and was removed to the Fever Hospial.

This is another complex case. Whether the condition was tuberculous or autotoxic or a mixed infection it is difficult to say.

Autotoxic Arthritis (probably Bronchitic).

Annie H., æt. 36, single, seamstress, was in the Infirmary in December, 1903. She told us she had always had a " weak bronchitic chest." She had had influenza several times; the first attack was five years before her admission. For the last eight years she had had trouble with her right knee every year. The joint became swollen and painful. Her last attack began in June after climbing. There was no illness except the bronchitis at the time of or immediately before the first joint trouble eight years ago, and she had no injury. During the first attack she was laid up for some weeks and the knee was swollen, hot and painful, but got quite well after a few weeks. The second attack was four years ago, when she was laid up for some weeks. Since then she has had pain in the knee every winter, but has been laid up only twice, each time with the same symptoms.

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The knee was swollen and painful before she began to climb, but got worse afterwards, and she has been in bed since August, when she had a slight attack of "inflammation of the right lung."

Four years ago she was said to have ulcer of the stomach, and had "anæmia" six years ago. For the last two years she has had leucorrhœa.

On examination, the right knee was found much swollen with the joint outlines obliterated. The knee was fully extended, and the swelling did not appear to be due to fluid. There was very little active mobility of the joint, passive movement was very painful and the limb lay flaccid and toneless. There was thickening round the upper end of the tibia with prominence of the subligamentous fat pads and perhaps slight thickening round the femur. No obvious heat or redness of the joint, and no constitutional disturbance. The right ankle was slightly swollen, and the toes were pointed. There was profuse leucorrhœa at the time of admission; this soon got less after treatment.

This patient was in Hospital a month, and was treated at first by application of a splint with douching for the leucorrhœa, and iodide of potassium, and the joint was massaged at first once in three days and later daily. The swelling subsided a good deal and some mobility had returned on her discharge to the Convalescent Hospital.

The interest of this case is rather in the difficulty of assigning the correct cause than in finding a cause, and it is probable that more than one factor contributed. There can, I think, be little doubt that the joint mischief was due to absorption; it was an autotoxic arthritis; the local characters of the joint lesion were quite those of such an affection. The history indicates absorption from the chronically inflamed pulmonary mucous membrane as the starting point, and it is possible that the gastric and uterine disturbance as well as overstrain may have contributed to the later attacks.

Notes by Dr. Ollerenshaw.

Autotoxic Arthritis (Tonsillitis).

Edith S., æt. 12, was seen September 24th, 1907. She had

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suppurative otitis in infancy, but recovered, and has had no ear trouble since. For years she has had tonsillitis, any exposure to wet or cold bringing on an attack. She has menstruated regularly since April, 1906. In October, 1906, her attendance at school entailed many wet walks, and at this time both her wrists became swollen and painful.

The mother was told the child had rheumatoid arthritis, and must winter for two years in a well-known health resort. She was also advised to have the tonsils removed; so probably the source of the joint trouble was recognised. The tonsils and adenoid vegetations were removed, and the general health, as well as the condition of the wrists, soon got better. She was seen in December, when, beyond a certain amount of swelling of the wrists, there appeared to be little wrong.

Traumatic Osteo-Arthritis (? Tubercle).

Elizabeth S., 22, single, admitted October 19th, 1904. When 7 years old the left knee was injured by a kick. The joint became swollen, but there was no pain afterwards for five years, when the joint became flexed and remained swollen until her admission to Hospital. On examination, the knee was slightly flexed and swollen on the inner side where there was a ridge of bone corresponding to the articular border of the tibia. There was considerable mobility, but with marked grating, and the movements of the patella were restricted. The joint was opened by the transpatellar method, and it was found that the cavity was practically obliterated and its place taken by thick fibrous bands. There was no pulpy thickening and no caseation. There was some growth of bone on the articular surfaces which were devoid of cartilage in places, while over the condyles of the femur fibrillation of cartilage was present. The case was apparently regarded as a tuberculous one, but microscopic examination of the tissue removed failed to show proof, and there was no caseation. The patient's history did not suggest tubercle, and her only illness appears to have been " inflammation of the bowels " at 19 years of age. She recovered well from the operation.

The case is introduced here to illustrate the fact that osteo-

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phytic outgrowth with fibrillation of cartilage and eburnation of bone are conditions not limited to "rheumatoid arthritis," but may occur in a case which may have been tuberculous or may have been simply traumatic.

Metabolic or Trophic Arthritis (Gout).

Thomas G., æt. 46, was in Hospital in May, 1903. Seven years before admission he was laid up for nine weeks with inflammation of both knee joints, which he attributed to constantly knocking them at his work. Since that time he has never been able to walk properly. The right knee was said to become swollen and very painful whenever he knocked it or knelt upon it. He has been frequently laid up for a fortnight on account of it. His general health was good. On examination of the right knee it was found slightly swollen, very painful if he stood on it or bent it, and there was crackling on movement. The man was very positive that the condition was entirely due to his work, and he was so much crippled by it that, on the assumption that the trouble was probably due to localised thickening of the synovial fringes, the joint was opened, on May 29th, by a transverse incision below the patella. The appearance of the interior of the joint was remarkable; it looked as if the joint had been injected with white paint which not only covered the articular surfaces, but infiltrated in lines the ligaments around, including the ligamentum patellæ. The urate of soda, of which the paint-like substance consisted, was scraped and washed away as far as possible, but much of it remained behind. The joint was closed, and though there was some rise of temperature for ten days, he recovered, and was discharged on June 22nd. He was seen again in October, and still complained of pain on movement of the joint or if he put weight upon it, and he is better while he wears a back splint. He then told us that he had swelling of the knuckles some four years previously; this was also attributed to injuries. Both knees were still tender and the knuckles were then red and slightly swollen. The history of this case was somewhat complicated by the desire of the patient to obtain a certificate that his troubles were due to his work.

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In December, 1907, Dr. Bury kindly showed me in his wards a man of 52, with a strong family history of gout. The patient was a publican, and had tophi in his ears. Without going into detail, he may be said to have had many attacks of joint inflammation during the past twenty years. At the time of his last admission both ankles were somewhat swollen and stiff. Both knees were swollen, and showed well marked osteophytic outgrowths, and on movement, which was fairly free, it was evident that the synovial fringes were thick and nodular. The first interphalangeal joint of the right ring finger was the seat of fusiform swelling with stiffness. The temporo-maxillary joints were not apparently affected. He had gonorrhœa twenty years ago. No source of infection had been found when I saw him, and it seemed probable that gout had some share in his arthritic troubles, but that probably some other element which we did not discover also participated. X-rays showed only blurring of outline of the joint margins with cloudiness of the cartilages.

The foregoing brief notes of a somewhat random selection from among the various forms of arthritis which necessarily come under the notice of those who work long in a large hospital are put together rather as suggestions than as complete records, but even so much would not have been possible without the kind assistance of my colleagues in asking me to see, from time to time, patients under their charge. To them I offer my best thanks. Among those colleagues perhaps no one took a greater interest than did Dr. Dreschfeld in the more obscure varieties of joint lesion, and had his life and power of work continued we might well have looked to him for help in clearing up the confusion in which the nomenclature and arrangement of diseases of the joints at present remains.

Should circumstances permit it is hoped on a future occasion to enlarge the record of cases of which I have more or less complete notes, and to collate the references to published papers illustrative of some of the conditions to which reference has been made.

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THE SUPERVENTION OF EPITHELIOMA UPON LUPUS VULGARIS.

By ROBERT B. WILD, M.D., M.Sc., M.R.C.P.,

Professor of Materia Medica and Therapeutics in the University of Manchester; Honorary Physician to the Manchester and Salford Hospital for Skin Diseases, and to the Christie Hospital.

IT has long been known that scar tissue is a favourable site for the development of malignant disease, and many papers have been written upon the subject since 1852, when Dr. James Reid, in the *Provincial Medical Journal,* wrote his excellent paper upon the "Identity of Warty Ulcerations of Cicatrix with Epithelial Cancer," and described a number of cases in which the growth was squamous epithelioma and the clinical course similar to what we see at the present day. The marked proclivity of the scars of lupus vulgaris to these growths was specially noted by Mr. Jonathan Hutchinson, and a typical case is described and figured in the *Archives of Clinical Surgery*, vol. ii. Other cases have been described, notably four by Dr. Norman Walker in the *Scottish Medical and Surgical Journal* for 1904, which occurred in patients who were under X-ray treatment for lupus vulgaris.

My reasons for bringing forward additional cases are, firstly, that I believe this terrible complication of lupus vulgaris to be more frequent than is generally supposed; secondly, that there is a marked family likeness in all the reported cases of this character, and certain pecularities in their mode of onset and clinical features seem worthy of careful study as likely to throw light upon the wider problem of the etiology of malignant disease in general; thirdly, I do not know of any cases hitherto published that have been followed to their termination, and in which it was possible to compare cases treated by X-rays with older cases not so treated.

Mr. Malcolm Morris, in his *Text-book on Diseases of the Skin,* remarks that "as a class sufferers from lupus are not

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long-lived," and this statement is borne out by the statistics of my cases at the Manchester and Salford Skin Hospital. From January 1st, 1894, to May 23rd, 1906, I have notes of 20,000 cases, of which 413 (2 per cent.) were tubercular—excluding 104 cases of lupus erythematosus. Lupus vulgaris accounted for 290 (1·45 per cent. of all cases), tuberculosis verrucosæ cutis for 40, and other tuberculous lesions for 83. Of the lupus vulgaris cases 134 were males and 156 females, and the age distribution was as follows:—

Under 15 years of age, 98 cases.
Over 15 and under 25, 102 cases.
1 case developed epithelioma.
Over 25 and under 35, 40 cases.
Over 35 and under 45, 29 cases.
Over 45 and under 55, 10 cases.
Over 55 and under 65, 7 cases.
Over 65 4 cases.
5 cases of epithelioma.

Thus only 50 cases were of age 35 and upwards, and of these 5 (10 per cent.) developed epithelioma. The oldest case of lupus vulgaris was aged 81; the disease had lasted 70 years and was still active in places; there was no epithelioma in this case, though the scarring covered large areas and the nose and both eyes were completely destroyed.

In addition to the six cases from the Skin Hospital three cases have been under my care at the Christie Hospital. For the sake of brevity in the following account of these nine cases only the points bearing upon the special lesions are given:—

CASE 1. Eliza A.D., spinster, aged 68. Admitted to Christie Hospital August 14th, 1893. Died December 19th, 1893.

As a child she had lupus vulgaris of the face, which was partially restrained by treatment, but repeatedly ulcerated up to the age of 37. The scarred condition which resulted from the disease remained practically unchanged for thirty years.

About twelve months before admission an ulcer appeared on the upper part of the right cheek and spread rapidly. A few months later a second ulcer appeared on the lower part of the same cheek.

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On admission the face presented a typical lupus scarring over both cheeks, the lower part of the forehead and the right side of the neck; the tip and alæ of the nose and part of the right ear were deficient. The lower eyelids were drawn down and everted by the scarring of the cheeks, and there was an opacity on the right cornea. The upper part of the right cheek presented an extensive, irregular ulceration with raised hard edges, a nodular base and a foul discharge. It extended from one inch anterior to the right external auditory meatus to the left side of the bridge of the nose, and from the edge of the lower eyelid almost to the level of the upper lip; at the lower anterior corner a sinus penetrated into the buccal cavity. Below this ulceration and separated from it by nearly an inch of healthy scar tissue was a second ulceration about one-third the area of the first and extending almost to the lower margin of the jaw.

On October 10th an independent nodule was noticed above the larger ulceration and just posterior to the external angular process of the frontal bone; this nodule soon formed a third ulceration.

The growths spread rapidly, and by the beginning of December had coalesced and destroyed the whole of the right side of the face. The patient died from exhaustion on December 19th.

There was no enlargement of any lymphatic glands, no secondary visceral growths were found at the post-mortem, and microscopically the growth was a typical squamous epithelioma.

CASE II. John M.G., rope maker, aged 44. Admitted to Christie Hospital November 5th, 1896. Died July, 1897.

Lupus vulgaris of the face since a child; commenced work at a rope-walk at the age of 8; was a patient of the Manchester Royal Infirmary at 16 for nearly two years.

About nine months before admission he noticed a hard "pimple" on the left cheek which gradually enlarged and ulcerated. A month later he scratched the right cheek and the slight injury did not heal, but gradually extended to form an ulcer with hard edges. He was treated at the Skin Hospital by Dr. Brooke, and shown as a case of epithelioma on a lupus scar at a clinical meeting of the Manchester Medical Society. He did not improve, and was sent to the Christie Hospital.

On admission the lower two-thirds of the face was formed of scar tissue and the lips were much thickened. On the right cheek was an irregular ulceration about two inches in diameter; the centre of the ulcer was on a level with the commissure of the lips, and the anterior edge reached to within half an inch of the angle of the mouth. The margins were indurated and slightly raised, the base hard and nodular; there was a slight discharge.

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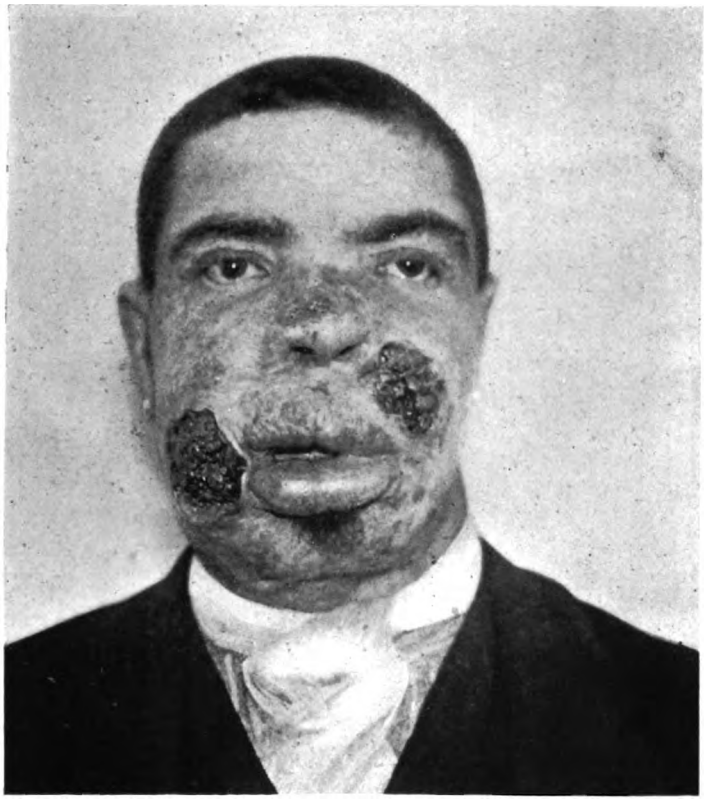

Fig. 1, Case 2.—Old lupus scar. Epithelioma of rodent ulcer type on each cheek.

Fig. 2, Case 5.—Recurrent epithelioma on nose. Lupus vulgaris on nose and both cheeks.

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On the left cheek just outside the ala of the nose there was a smaller ulceration of similar character and about two-thirds the size. (Fig. 1.)

He left the hospital at his own request, and was re-admitted February 8th, 1897, when the growths had considerably extended; the ulceration on the right side now involved both lips. There was no enlargement of the lymphatic glands.

The growths spread rapidly, and he finally died in the Union Hospital in July, 1897.

CASE III. John M., blacksmith, aged 37. Admitted to Christie Hospital July 21st, 1897. Died November 15th, 1898.

Mother died from phthisis. History not clear as talking was very difficult for him, but the scarring of the left side of the face, the dragging downward of the left lower eyelid, the destruction of the lower part of the nose and the cicatricial remains of the left ear showed that there must have been extensive lupus in early life.

The ulceration, which he still called lupus, commenced in April, 1895, at the left side of the upper lip near the nose. He was operated upon by Mr. Southam at the Manchester Royal Infirmary, who removed the growth and transplanted a flap of skin from the left arm to fill up the deficiency in the upper lip.

On admission there was a fluctuating swelling of the left cheek near the upper lip; this soon broke down and disclosed a large cavity opening into the mouth and nasal fossæ. The anterior part of the hard palate, the vomer, turbinated bones and left superior maxilla were partially destroyed. The margins of the cavity soon became hard, raised and nodular except below, where the transplanted flap from the arm formed the boundary and was never infiltrated by the growth. As the ulceration extended this flap was separated as a whole.

The destruction of tissue by the extending growth proceeded slowly, but at the time of his death, sixteen months later, of the whole face only the forehead, right eye and lower jaw remained. There was no enlargement of the lymphatic glands. No secondary growths in the viscera were found at the post-mortem, and microscopically the growth was an epithelioma.

CASE IV. Sarah W., married woman, aged 42. Admitted to Christie Hospital July 19th, 1897. Died in the Hospital May 3rd, 1904.

Lupus of the face since childhood, intermittent treatment up to the present time. For several years she has had a "wart" below the chin on the left side which has gradually increased in size.

On admission the whole of the left side of the face and neck was covered by lupus vulgaris with superficial ulceration due to pus infection; abundant apple-jelly nodules round the margin of

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the diseased area. There was a similar patch on the crown of the head, and some cicatrisation of the nose and left ear. Below the chin, on the left side, was a hard oval growth 1½ inches long, 1 inch wide and ⅜ inch high; the surface was papillomatous. The growth was excised and microscopically examined; it was found to be a papilloma, though one part of the section showed a suspicious downgrowth of epithelial processes with a few cell-nests, which were, however, in the superficial layers of epithelium.

After recovery she was transferred to the Skin Hospital, and remained under treatment for lupus as an out-patient. Her attendance was irregular, but she slowly improved until January 31st, 1900, when a fresh growth of a fungating character was found on the scar of the previous operation. After temporary improvement by caustics it relapsed, increased rapidly, and she was again admitted into the Christie Hospital. The growth was widely removed on June 25th, 1900, and though much scarring resulted there was no recurrence on this site.

Again an out-patient intermittently at the Skin Hospital until June, 1901, when a papillomatous growth was found on the centre of the left cheek. She was put under X-ray treatment July 9th, 1901. After six months' treatment the papilloma had disappeared, and the lupus was greatly improved. Treatment was stopped January 25th, 1902. She returned to the Hospital March 17th, when a warty condition was again found on the centre of the left cheek. Treatment was resumed with closer applications of the tube. Some burning followed, but soon subsided, and the warty patch completely disappeared. Treatment was continued for the lupus, which, though much improved, was still very extensive, until on March 18th, 1903, a fresh warty growth was found on the left cheek. In view of the previous result the X-rays were pushed, and by May 30th a typical and painful burn resulted, and the treatment was stopped; the warty growth had completely disappeared. For four months there was no sign of healing, but by December, 1903, that is, seven months afterwards, two-thirds were healed. Towards the end of this month, however, a fresh growth of fungating character was found on the parotid region and below the left ear, posterior to the former growth and to the site of the X-ray burn. The X-rays were applied to the fresh lesion, but after a fortnight it was found that it was extending rapidly. She was again admitted to the Christie Hospital, and the growth removed February 8th, 1904. It recurred immediately, and was treated by formalin, but without any benefit. The growth spread rapidly over the face and neck, and she died from exhaustion May 3rd, 1904.

There was no enlargement of the lymphatic glands. At the post-mortem no secondary growths were found in any part of

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Fig. 3, Case 5.—Later stage. Nose well; lupus on cheeks improved; epithelioma on right cheek, with extension downward.

Fig. 4, Case 6.—Recurrent epithelioma on lupus scar; fungating type; extending towards chin by fresh growths in scar.

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the body. The growth was shown microscopically to be a squamous epithelioma.

CASE V. Olivia W., married woman, aged 46. Admitted to Christie Hospital October 5th, 1900. Died July, 1903.

Suffered from lupus vulgaris of the nose and cheeks for over twenty years. During the last twelve months the skin over the lower part of the nose has become hard, fissured and painful. In June she became an out-patient under me at the Skin Hospital. Both cheeks were covered by typical lupus vulgaris; the nose presented a scabbed appearance over the lower third, and beneath the scab was a hard irregular shallow ulceration with well-defined edge. No improvement was produced by treatment, and she was transferred to the Christie Hospital, where the ulcer was removed under chloroform by a sharp spoon, and the thermo-cautery freely applied to the whole area. The wound healed well, and she was discharged November 8th, 1900. She remained well until September, 1901, when a fresh ulceration of epitheliomatous character was found on the nose. (Fig. 2.) On October 6th, 1901, she commenced treatment by the X-rays, and by the middle of April, 1902, after a sharp reaction, the nose was quite healed. The lupus had considerably improved, and at her own request X-ray treatment was resumed at the end of May, 1902, for the cheeks. This was continued at intervals during the year. There was a sharp reaction, especially on the left cheek, which, however, healed easily after a period of rest, and the lupus greatly improved. On December 3rd, 1902, the centre of the right cheek presented a papillomatous growth, which quickly broke down to form a shallow circular ulcer with hard edges and a nodular base, and two smaller ulcerations appeared below the first. During the next three weeks X-rays were applied to the new growth, but without checking the extension, and the treatment was stopped January 12th, 1904. (Fig. 3.) On March 11th she was again admitted to the Christie Hospital, and the whole of the growth freely excised. The wound never healed, fresh nodules appeared from the base, the edges became hard and nodular and spread rapidly by the formation of fresh nodules in the surrounding skin, so that by the middle of May, 1903, the whole right side of the face was involved and part of the neck.

The patient died at home in July, 1903. There was no enlargement of the lymphatic glands. The growth removed was a squamous epithelioma.

CASE VI. Edward W., metal finisher, aged 48. Admitted to Skin Hospital October 14th, 1903.

Lupus vulgaris of the face and neck since childhood. Several years ago he had a warty growth on the right check in front of the ear. This was excised at the Salford Royal Hospital.

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Recurrence took place after a few months, and it was again excised, only to recur and necessitate a third operation six months ago. Three months before admission a warty growth appeared at the lower edge of the operation scar just below the angle of the jaw, and has grown rapidly. He presented lupus vulgaris with superficial scarring over the whole of the face below the level of the eyebrows and extending on the right side of the neck to the level of the clavicle. On the right cheek are the scars of his three operations, and below the angle of the jaw a raised hard growth about 2 inches in diameter and half an inch in height.

As he objected to further operation, he was at once treated by X-rays, and though the extension of the growth was checked it did not diminish.

On February 3rd, 1904, I took him into hospital. Formalin was applied, the mass of the growth removed, and the X-rays continued to the base. By March 5th the growth had gone and a healthy ulceration only remained. On April 6th there was slight induration below the ulcer, and on the 22nd recurrence was evident. The X-rays were resumed, but the fresh growth has continually extended, and there are now signs of fresh nodules anteriorly along the angle of the jaw. (Fig. 4.) These rapidly coalesced with the main portion of the growth. As the X-rays were doing no good and possibly might do harm, they were stopped, soothing antiseptic lotions applied and the growth gradually extended until he died at home from exhaustion in the autumn of the same year.

Case vii. Albert M., æt. 18, factory operative.

Lupus vulgaris on the centre of the left cheek from the age of 3. Operated on twice at home when 5 years of age, again in Liverpool at 7, twice in the Wigan Infirmary at 13 and 14. Patient at the Manchester Skin Hospital in September, 1901, when 16 years of age. There was extensive scarring on the left cheek, chin and left side of the neck. Active lupus vulgaris at the edges of the scar and on the nose, which was stated to have been first atacked three weeks before. Large healed scars on the flexor surface of the left leg, and still active lupus behind the left knee and on the ankle (Fig. 5.) In December, 1901, treatment by X-rays was commenced and continued rather irregularly owing to illness at home and intervals for rest during 1902 and 1903. In December, 1903, he had a dermatitis from X-rays which resulted in a slight burn. No further sittings were given, and the surface was completely healed in March, 1904. He was seen on May 11th, 1904, and the scar was healthy.

On June 25th, 1904, he came to the Hospital with what appeared to be a small carbuncle with a black central slough on the lower part of the left cheek and below the scar of the X-ray burn. He looked ill, and his temperature was 100°F. Under

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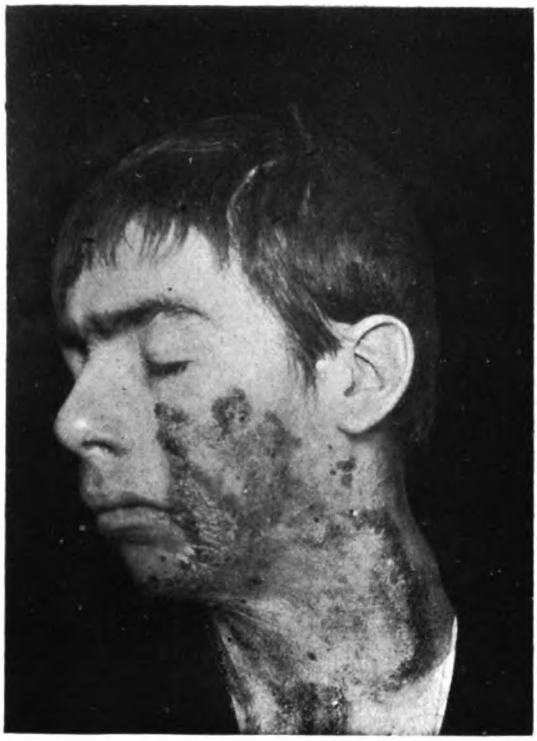

Fig. 5, Case 7.—Lupus vulgaris with extensive scar. Before X-ray treatment.

Fig. 6, Case 7.—Three years later. Lupus much improved by treatment. Epithelioma on lupus scar; fungating type.

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treatment by boracic fomentations, etc., the inflammatory lesion settled down, but on July 27th the site of the carbuncle presented a raised papillomatous appearance. He then remained at home under his own doctor, and was not seen until September 17th, when the growth was larger, hard, and presented a painful ulceration in the centre. On October 24th, 1904, the epitheliomatous character of the growth was very evident; it was 2½ inches in diameter and ¾ inch in height (Fig 6.) Operation was refused by the patient and his friends, though urged upon them as soon as a papilloma was found. He left the Hospital at the end of January, 1905. The growth rapidly spread over the face and neck, and he died at home in July, 1905. No secondary lesions were found in the glands while under observation. As excision was refused no microscopical examination was possible, and there was no post-mortem examination.

Case VIII. John K., æt. 65, blacksmith. A broken-down old man; cataract in both eyes, the left operated upon with fair result. Lupus vulgaris on the face for over 20 years. Extensive scarring of the right side of the face with flat patches of superficial lupus vulgaris, and well-marked nodules on the cheek and right side of the nose. He had had no light or X-ray treatment. On the right molar bone in the scar tissue was an ulcer ½ inch in diameter with hard raised edges and a suppurating base, a history of two months' duration and the application of irritating ointments. He refused operation, and was put under X-rays February 24th, 1904. On November 16th, 1904, he was discharged healed. Next seen June 28th, 1905, when the ulcer had again broken down and was somewhat larger than when first seen. The X-rays were resumed, but he was very irregular in his attendance. The ulceration continued and spread, and he ceased to attend in September, 1905. I have not heard directly from him since, and was told by a patient from the same neighbourhood that he was dead. There were no secondary deposits in the cervical glands.

Case IX. William R., 38, farmer, strong and healthy. March 3rd, 1906, came to Skin Hospital. Since childhood had lupus vulgaris of the face and neck; typical scar present over the whole of the left side of the face, lower part of the ear, chin and neck to beyond the middle line. The scar presented scattered lupus nodules, and there was active disease at the edge, especially on the left side of the nose, on the chin below the mouth and on the neck to the right of the middle line. No X-rays or light treatment. Over the lower part of left cheek and upper part of the neck (almost the centre of the lupus scar) was a large ulcer 4 inches in diameter, edges raised, nodular and hard. Base irregular and with a sanious, foul-smelling discharge. He stated that the ulcer began like a boil in the summer, and had been rapidly enlarging during the last two

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months. Treated for a month with carbolic dressings and then put under X-rays, which were continued—with intervals for rest—for four months. At first the effect was good and the more superficial parts of the ulcer healed irregularly, so that we had a scar with a number of smaller isolated epitheliomatous ulcers. Later on, however, these began to spread and coalesced. The X-rays were stopped April 17th, 1907, and since then he has had merely carbolic lotion to cleanse the parts and a boric acid ointment, with morphia internally.

I saw him October 19th, 1907, and the ulceration now occupies more than half the face, the cavity of the mouth is opened up and the lower jaw dissected out; the left ear is gone and the neck invaded to the middle line behind and almost to the clavicle in front. He is much weaker and will probably live to about Christmas.* No secondary lesions in the cervical glands.

In considering these nine cases certain points arise which seem to be worthy of further consideration. These are:—

(1) The etiology of the epitheliomatous growth. In several cases there was a history of slight trauma or mechanical irritation of the scar at the site where the growth subsequently appeared. In three cases an inflammatory lesion, due apparently to pus infection, was seen and treated, and its subsidence followed by a papillomatous growth which became epitheliomatous. In three cases the growth appeared on an area which had been, or was being, treated by X-rays, though not actually on the site where the greatest reaction had been produced.

(2) The character of the lesions. In all those seen at the commencement the lesion was primarily of a papillomatous character, and in most of the others the earliest lesion noticed by the patient was of this type. Ulceration commenced in the centre and the edges gradually became indurated, and from this point onward two distinct types are found—one of a fungating character with rapid spread and formation of a growth of considerable size, the other breaking down into deeper ulcerations in which destruction almost kept pace with new growth. These latter cases were less rapid in their progress, and in their later stages were not easy to distinguish clinically from rodent ulcer.

(3) The tendency to form multiple lesions or successive lesions on different parts of the lupus scar, and for the disease to

*The patient died January 7th, 1908.

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spread by the formation of fresh foci in the apparently healthy scar tissue beyond the margins of the primary growth. I am inclined to look upon these later lesions as mostly due to transplantation of epitheliomatous cells from the breaking down primary growth on to the scar tissue. In several cases, however, the multiple lesions were apparently independent growths, and it is not difficult to conceive that the whole of the tissues in a lupus scar may be in a state of unstable equilibrium, so that any exciting cause of cell proliferation—whether mechanical irritation, parasitic invasion, or ethereal vibrations—may disturb the balance between epithelium and connective-tissue and determine the onset of a malignant growth at one or at several points.

(4) The absence of secondary deposits in the lymphatic glands, though the growths were microscopically squamous epitheliomata and usually rapidly growing. In the cases examined post-mortem secondary visceral growths were also absent. The natural explanation of this appears to be the destruction of the lymphatics by the preceding lupus and the possibility that the scar tissue with its slight vascularity contains no lymphatic vessels capable of transmitting the comparatively large epithelial cells to the nearest glands. In one case, however, the epitheliomatous infiltration was found post-mortem to have extended into and infiltrated the underlying muscle tissue and yet the glands were unaffected.

(5) The effect of the X-rays. Three of the nine cases (i., ii. and iii.) occurred before the discovery of the X-rays, the course of the disease was the same as in the later cases and in one of them the destruction of tissue was the greatest I have ever seen. Three other cases (vi., viii. and ix.) were well developed epitheliomata when admitted to the Hospital, and were treated by X-rays with temporary benefit; one healed up after nine months' treatment, but broke down again some five months later; in the other two the benefit was very transitory, and the treatment was stopped as the growth was rapidly extending. In the remaining three cases (iv., v. and vii.) the patients were treated by X-rays for lupus vulgaris, and the growths appeared upon the surface of the treated scar. Case iv. had a papillomatous growth, recurring after removal before any X-ray treatment was

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used. The growth which eventually caused death was on a different site it formed before and was twice removed by the X-ray treatment, only to recur later and spread in spite of X-rays pushed to the limit of reaction. Case v. also had an epitheliomatous lesion on the nose, recurring after operation and healed by X-rays without subsequent recurrence. The growth eventually fatal formed on the right cheek, and it is worthy of note that the only marked reaction to X-rays was on the left cheek. Case vii. was unusual in the early age of the patient; he was treated for a considerable time, and an X-ray reaction was produced on the left cheek; the subsequent epithelioma formed just below this and not where the reaction had been most severe. It is not possible to say in these three cases whether the X-rays had any part in the production of the epithelioma. If so then it appears as if a special intensity of radiation was needed, something more than a therapeutic dose and something less than sufficient to produce an X-ray burn. One thing, however, is certainly demonstrated by these three cases, viz., that the X-rays employed for the treatment of the lupus had no prophylactic value in preventing the formation of epithelioma.

(6) Finally, I wish to emphasise the importance of warning all middle-aged patients with lupus scars of the necessity of at once applying for treatment should the scar show any tendency to a warty formation or ulceration. Superficial lesions of this character may be treated by X-rays as in several of the above cases, but usually recur, and the same may be said of surgical removal. I believe, however, that an immediate and complete excision—even though the operation has to be carried out through scar tissue—offers the best chance of cure, and in any case prolongs the life of the patient and affords a period more or less prolonged before the growth recurs or a fresh lesion appears.

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THE SURGICAL TREATMENT OF LABYRINTHINE SUPPURATION.

By W. MILLIGAN, M.D., *Aurist and Laryngologist to the Royal Infirmary, Manchester; Surgeon to the Manchester Ear Hospital; Lecturer upon Diseases of the Ear, the Victoria University of Manchester.*

THE vast majority of cases of labyrinthine suppuration are secondary to chronic, more rarely acute, septic disease of the middle ear. The most frequent paths of infection from the one cavity to the other are:—

(1) Through a fistulous tract in the external semi-circular canal.

(2) Through the fenestra ovalis.

(3) Through the fenestra rotunda.

In only from 1 to 2 per cent. of cases of chronic septic otitis media does labyrinthine infection result. This no doubt is due to the denseness of the bone forming the labyrinthine capsule, and to the rigidity of the annular ligament and the membrana secundaria.

Once septic infection has gained access to the internal ear there is nothing to prevent its passage to the base of the brain or to the surface of the cerebellum.

The various paths along which pathogenic organisms travel brainwards are the perivascular sheaths of the auditory or facial nerves, the aqueductus vestibuli, and in exceptional cases by erosion of the superior semi-circular canal. Another path of infection is at times possible, viz., by transference of organisms along Mouret's canal, a canal running from the posterior wall of the mastoid antrum through the pars petrosa and opening upon the posterior wall of the pyramid above the internal auditory meatus. (Fig. 1).

The surgery of labyrinthine suppuration has received a great impetus from the writings of Lermoyez[2], Gradenigo[12], Friedrich[11], Jansen[1], Hinsberg[3], Botey[5], Bourgouet[19] and others, yet it may be said to be still in its infancy.

Various operative procedures have been devised for the

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purpose of exposing the area of disease and for eradicating, if possible, the foci of infection.

Whatever means be adopted to open up the labyrinth, the first, and an essential, step is the performance of a " complete radical mastoid operation " with a free and generous removal of the facial spur. (Fig. 2.) In this way the outer labyrinthine wall is brought fully into view, and under a powerful illuminant fistulous tracts are carefully looked for. A word of caution is necessary here, as it is very easy to mistake the opening of a minute bone cell for the mouth of a fistulous tract. A very careful examination with a probe is essential under such circumstances.

The main practical difficulties experienced in opening up the labyrinth are due to the anatomical disposition of the following structures: the facial nerve, the internal carotid artery, the jugular bulb and the superior petrosal sinus.

If during the performance of the radical mastoid operation the facial spur be freely cut away the position of the fenestra ovalis and the fenestra rotunda is readily demonstrated.

The horizontal semi-circular canal is invariably situated 3 mm. above the Fallopian aqueduct, and is usually separated from it by a small furrow in the bone. Occasionally, however, the one merges imperceptibly into the other. The general direction of the external canal is oblique, and not horizontal as its name would imply. (Fig. 3.) Its anterior arm is 5 mm. in length, and opens into the posterior wall of the vestibule by a dilated orifice. This opening is $1\frac{1}{2}$ mm. above the Fallopian aqueduct, or $4\frac{1}{2}$ mm. above the fenestra ovalis, and is found in a vertical line drawn through the posterior border of the oval window. The posterior branch opens also upon the posterior wall of the vestibule.

The anterior branch is situated almost invariably above the facial nerve, but in a certain proportion of cases—estimated at about 12 per cent.—it occupies a lower position and is crossed by the facial nerve.

Various methods have been suggested for opening up the interior of the labyrinth.

Jansen, to whom the credit of having first opened the labyrinth

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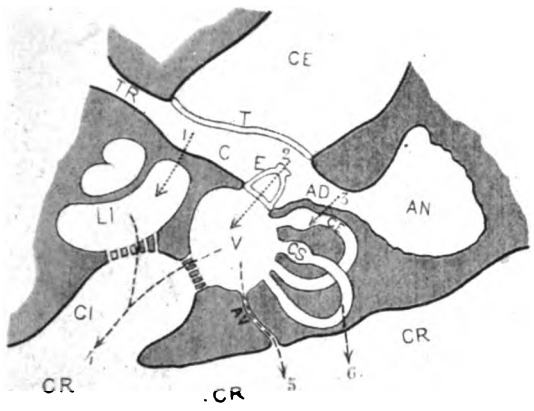

FIG. 1.—Diagrammatic view (after Lermoyez) of the usual routes of septic infection from the middle to the internal ear (1, 2, 3) and from the internal ear to the interior of the cranium (4, 5, 6). CE, External meatus; T, membrana tympani; AN, mastoid antrum; LI, cochlea; V, vestibule; AV, Aqueductus vestibuli; GE, external semicircular canal; GS, Superior semicircular canal.

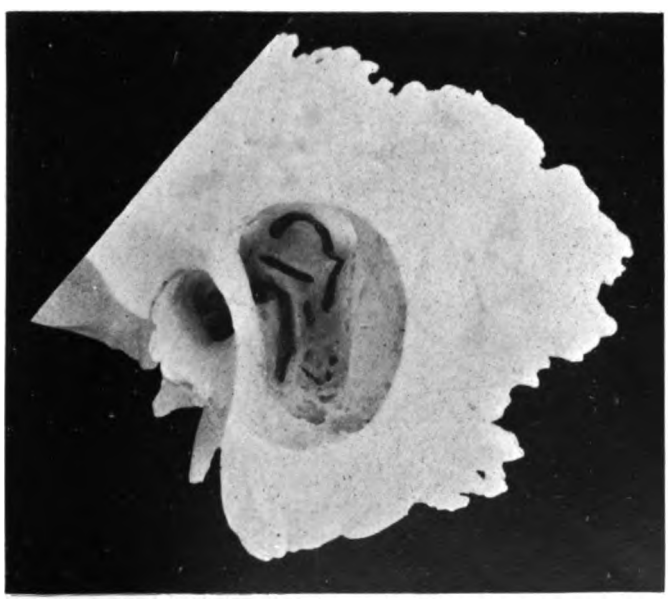

FIG. 2.—Complete radical mastoid operation with view of outer labyrinthine wall. The horizontal, superior and posterior semicircular canals have been opened up to show their relative positions. The aqueductus Fallopii has also been freely opened up. A portion of the posterior (bony) meatal wall has been left intact.

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is due, performs a complete radical mastoid operation, and freely exposes the outer labyrinthine wall. The posterior branch of the external canal is located and opened. By working in a direction forwards and upwards its anterior branch is followed into the vestibule. The opening thus made is carefully enlarged, great care being taken to avoid wounding the Fallopian aqueduct which in normal cases is situated 1½ mm. below the ampullary orifice of the anterior branch of the external canal. In performing Jansen's operation care must also be taken to avoid injuring the dura mater and the superior petrosal sinus above and the jugular bulb below.

Botey opens the vestibule by taking as his immediate landmark the anterior limb of the external canal, opening it and enlarging the opening thus made anteriorly and superiorly. Should the stapes happen to be still *in sitû* he removes it, if not he opens the fenestra ovalis and cuts away the posterior portion of the pars promontoria between the two fenestræ.

In this way an opening is made both in front of and behind the curve of the Fallopian aqueduct.

Hinsberg, after a complete and radical mastoid operation, opens the fenestra ovalis by the removal of the stapes if still present. The opened fenestra is carefully enlarged in an upward direction. A small stylet is then introduced into the vestibule as a guide, and the bony covering of the anterior limb of the external canal is cut away until the stylet is exposed to view.

The Bridge Operation.

The operation which I have performed in 10 cases of severe labyrinthine suppuration and which has given excellent results is as follows:—A complete and radical mastoid operation is first performed, and in order to secure free access to the whole operation area the following method of making a flap from the soft parts is adopted:—A long knife is introduced into the meatus and made to cut vertically outwards along the line of junction between the superior and posterior cartilaginous walls of the meatus. The incision is carried well into the concha. The knife is now swept round in a circular direction parallel to the curve of the anti-helix to the floor of the meatus. The comparatively large flap thus secured is trimmed, and folded

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downwards and backwards on to the floor of the excavated mastoid process. The flap is kept in position by two silkworm strands passed first through the skin of the neck, then through the flap and back again to a point close to the original point of entry and tied over a rubber tube. The petro-mastoid is now entered in the triangular space between the posterior limb of the external canal and descending limb of the posterior canal. This little triangle is situated 4 mm. behind the highest point of the extreme convexity of the descending portion of the Fallopian aqueduct.

The opening thus made is enlarged upwards and backwards until the posterior canal is freely opened. By now working forwards along the external canal its anterior limb is opened, and by following this the vestibule is ultimately reached.

A special "facial protector" (fig.4) is now inserted and lies over the aqueduct in the form of a cap. The fenestra rotunda is then located, opened by means of a small bur and the pars promontoria cut away in an upward direction until the fenestra ovalis is reached, the stapes being removed if still present. By means of a specially-constructed bur cutting vertically the bone lying immediately under the aqueduct is cut away, so that finally, when the facial protector is removed the aqueduct appears like the arch of a bridge—end on, as it were, and facing the operator—between the semi-circular canal system behind and the cochlear system in front. (Fig. 5.)

Free drainage of the various segments of the internal ear is thus effected whilst the cavity is allowed to granulate, and finally to obliterate itself.

After the completion of the operation and when the auricle has been put back into position (not necessarily sewn back) the edges of the incised concha are trimmed in such a way that when the finger is placed in the enlarged meatus its edge is found to be on the same level as the floor of the exenterated mastoid.

In illustration of the above remarks the following three cases are cited:—

CASE 1. E. M., aged 35, had suffered from chronic suppurative middle ear disease for twenty years following a severe attack of scarlet fever. Attacks of deep-seated pain in and around the affected ear had been fairly frequent during a period of nearly twelve months prior to his admission to hospital. The more recent attacks of pain had been accompanied by sickness

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FIG. 3.—Section of temporal bone to show the relative positions of the fenestra ovalis, the Fallopian aqueduct and the horizontal semicircular canal.

FIG. 4.—The author's "facial nerve protector."

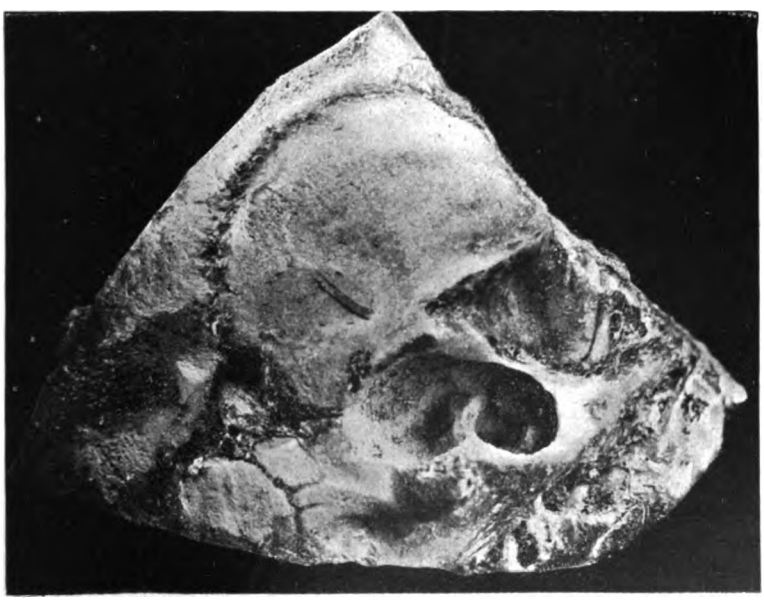

FIG. 5.—The completed "bridge operation."

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and severe vertigo, and had lasted for two or three days at a time.

On admission the following condition was noted:—The left external auditory meatus was filled by a mass of œdematous granulation tissue bathed in very fœtid and sanious pus. With a probe a sequestrum was felt in the depths of the tympanic cavity. The sequestrum appeared to be partially movable, and on pressure being applied severe vertigo was produced. The temperature was 100·8°F., and the pulse 80. There was marked horizontal nystagmus. Examination with the watch showed a profound degree of deafness, and various tuning-fork tests indicated almost complete destruction of the auditory nerve. There was no optic neuritis, but slight photophobia was present. Lumbar puncture was performed, and showed an excess of a perfectly clear cerebro-spinal fluid. A complete radical mastoid operation was first performed and all granulation tissue scraped out of the depths of the cavity with a sharp Volkmann's spoon. A large fistulous opening was now found in the region of the external semi-circular canal, and on careful examination with a blunt-pointed probe a sequestrum was at once detected consisting apparently of a portion of the canal and cochlear system.

The fistulous opening was enlarged upwards and also backwards. The stapes was found to be absent and a few drops of pus were seen to be well up through the open fenestra ovalis. The fenestra was carefully enlarged with a fine bur in a direction downwards and backwards towards the fenestra rotunda.

Two sequestra were ultimately removed, one consisting of a portion of the first and second whorls of the cochlea, and the other of a portion of the superior and external semi-circular canals.

The cavity thus produced and bridged over by the Fallopian aqueduct was very carefully curetted and gently swabbed with pure carbolic acid. A strip of gauze was passed under the bridge and packed lightly into the cochlea and also into the region of the semi-circular canals. This dressing was changed every second day. After two and a half months of regular treatment the whole cavity produced at the time of operation was filled up by healthy granulation tissue, and the external wound was closed. In this way complete obliteration of both the middle and internal ears was affected. As a result of the operation there was complete disappearance of all pain and vertigo and also of all auditory sensations upon the affected side.

Case II. T. R., male, aged 40. Had suffered for fifteen years from chronic suppurative middle ear disease upon both sides following an attack of scarlatinal diphtheria, which had also destroyed the sight of one eye. The hearing power upon the right side was seriously impaired, registering only 5 per cent. of the normal; upon the left side it was totally destroyed. The left auditory meatus was filled with pus and granulation tissue.

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No view of the membrana tympani was possible. Vertigo was complained of occasionally. There was no sickness. Tinnitus was present in the right ear, absent in the left. Deep-seated pain was complained of in and behind the left ear. The patient's mental condition was dull and apathetic. The outer labyrinthine wall upon the left side was exposed as in the previous case, and an erosion found in the posterior limb of the external canal. Through this defect in the bone a bud of granulation tissue protruded.

By means of a bur the tract was opened up and the posterior part of the vestibule exposed. The cochlea was then opened, just as in the previous case, and the after treatment carried out in a similar fashion. The patient made a slow but uninterrupted recovery, a permanent retro-auricular fistula being secured.

CASE III. M. A., female, aged 21, was admitted to hospital in a semi-moribund condition, complaining of pain in the right ear and a feeling of fulness and pressure over the head. For many years she had suffered from a foul discharge from the ear. Latterly she had complained of constant dizziness and a feeling of nausea.

Upon examination the patient was found to have slight right-sided facial paresis. The hearing upon the right side was completely gone. The meatus was found full of granulation tissue, and bare bone was easily detected with a probe. There was marked horizontal nystagmus, no optic neuritis and no paralysis of the oculo-motor muscles.

A complete radical mastoid operation was first performed, and a large cholesteatoma removed. The cholesteatoma had eroded the petro-mastoid, so that when thoroughly cleared out the membranous posterior and external semi-circular canals were clearly visible. The "bridge" operation, as detailed above, was completed. The patient made a slow and uneventful recovery, slight facial paresis, however, remaining.

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INTERMITTENT LIMP.

By ERNEST S. REYNOLDS, M.D. (Lond.), F.R.C.P.
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THERE is a condition which was described by Charcot in 1859 as intermittent claudication of arteries and which was named by Goldflam in 1895 intermittirendes Hinken (intermittent limp) and by Erb in 1898 dysbasia angiosclerotica. As the names intermittent claudication and dysbasia angiosclerotica both involve a preconceived theory I prefer the name intermittent limp. Although a perfectly definite affection I think it is not so generally recognized as it should be, for I believe it to be probably commoner than is usually supposed. I have seen the following five cases in the last two years.

CASE I. An officer in the army, aged 29 years, a finely built man and a great athlete, came to see me in April, 1905, and I saw him on several subsequent occasions together with my colleague, Mr. Thorburn. He went to a foreign station in 1902. He was said to have had phlebitis in the right leg in January and again in March, 1904, with œdema of the leg, pains in the calf, and "lumps" on the inner side of the knee. He came home in June, 1904, and was well for three months. He returned to his station in September, 1904, and then found that if he walked say 200 yards he had slight pains in his left leg in the calf, and at the back of his knee which at once caused him to limp, but if he rested the pain ceased. In March, 1905, similar pains also occurred in the right leg after walking. When I saw him he was complaining of much pain in the feet and calves, and both feet were cold and perfectly bloodless. His left leg was more painful than the right and in walking he kept the left ankle as rigid as possible and the knee somewhat stiff. The muscles of the legs were very well developed and firm, the knee jerks normal. No pulsation could be felt in the popliteal, posterior tibial or dorsalis pedis arteries of either side and the pulsation in the femoral arteries was weak. The radial and carotid arteries were normal, and of low tension and the heart and urine were normal. He told me that if he had had much walking during the day there was much aching in the limbs in the evening which became worse when he got into bed and lasted most of the night; but as a rule the pain and stiffness of the limbs passed away if he rested. He had never had syphilis. He was a fairly heavy smoker of strong tobacco.

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The condition of course interfered very greatly with his movements so that he had to apply for a prolonged furlough. He improved somewhat while taking nitrites, but he returned to his duties and in addition engaged in many athletic pursuits although still suffering occasionally from his pains. The condition still continues and indeed seems to have again become worse for I hear he has recently again returned to England as it was impossible for him to keep on with his military duties.

CASE II. A solicitor, aged 44, was sent to see me in September, 1906. He told me that he had always been fond of taking long walks. In May, 1906, while walking he had a feeling of numbness and compression in the right foot as if he had a tight boot on; the foot then became painful as if he had a corn in the sole and it became cold. When he looked at his foot he found it was white, but while he rested the pain gradually passed away and the colour returned in red patches which slowly ran together until the natural colour returned. These attacks then came on during any lengthy walk and the pain also reached up into the calf of the right leg so that he could not proceed. After resting the pain ceased but soon returned when he resumed his walk so that he had to return home limping on his way. The attacks came on more severely if he was walking on a hard pavement. He had no pain in the left leg.

On examination I found both legs well developed and strong, the knee-jerks, urine and heart normal, but the tension of the radial artery was slightly above normal. Pulsation in the right posterior tibial and dorsalis pedis arteries was only just perceptible, but on the left side was well marked. A radiograph of the right leg showed a faint linear shadow possibly of the posterior tibial artery. He told me he smoked about thirty cigarettes a day. I saw him again about three months later but he had not improved.

CASE III. The secretary of a technical school, aged 47, came to see me in April, 1907. He was a non-smoker and was very fond of bicycling. For many months while walking he had suffered from intense pain under the right heel and for three weeks previous to his visit this pain had spread into the right foot and up the front of the shin. Some times the pain started in the centre of the dorsum of the foot and spread up into the muscles of the front of the leg. If he looked at his foot during the attack the front of it was white "like that of a corpse." The attacks came on afer he had walked about 50 yards and compelled him to stop so that his "circulation in the foot could get going," the pain ceasing during the rest, only to return again a short time after his walk was resumed. The left foot never pained him. On examination his legs were

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normal except that the right foot was cold and white and no pulsation could be felt in the right posterior tibial and dorsalis pedis arteries, but was present in the right popliteal artery. Pulsation in the arteries of the left side was normal. The urine and heart were normal and the radial pulse was of low tension. His condition improved by massage.

CASE IV. A wine and spirit traveller, aged 64, came to see me in May, 1907. He was a fine-looking man, very well developed and muscular, especially so in the legs, and has always been energetic and a great walker and athlete. After an attack of influenza and typhoid fever four years ago, when he was in bed for sixteen weeks, he had pains in both calves. This recovered but returned in six months. It again disappeared but returned fifteen months ago and has been present in attacks since. While he is still or walking about the house he has no symptoms. If, however, he walks outside at an ordinary speed for about 300 yards he has a numb pain like toothache or a tightness just above the left ankle and in the calf which becomes acutely tender on pressure. If he stops walking the pain almost disappears, but if he walks another 200 yards it returns with greater intensity and is more in the form of cramp and he has to drag the leg after him. He has a similar but slighter pain also in the right calf at the same time but not so much in the right ankle and foot. If he takes his boot off during the attack the left foot is found to be quite white and although it is cold to the touch he says it has a hot sensation. He has never smoked but used to take a large amount of alcohol in his business, but has not done so for some years past, and he has no alcoholic appearance.

There is a considerable amount of albumen in the urine but no sugar; he has no other symptoms of Bright's disease, and the radial pulse is of low tension. No pulsation can be felt in the arteries of the left foot, nor in the dorsalis pedis of the right side, but the right posterior tibial artery is just perceptible, but much weaker than normal. He is somewhat short of breath on exertion, but he says this has always been the case, and there is a systolic mitral murmur which from his history has probably been present many years. He obtained no relief from potassium iodide or nitroglycerine or sodium nitrite.

CASE V. A labourer, aged 50, who went to the Out Patient Department of the Manchester Royal Infirmary some weeks ago was kindly sent to see me by my colleague, Dr. Brockbank. He was a well developed man with firm and strong muscles. Physical examination revealed nothing except that there was no pulsation in the right posterior tibial and dorsalis pedis arteries, and the right foot was colder than the left. He complained that for some months after walking a short distance he

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had great pains in the right foot and calf with cramps of the muscles which caused him to stop. After resting a time the pains and cramp-like feelings disappeared but again came on after walking a short distance further. There was nothing in his previous history to account for these symptoms, but he was a heavy smoker.

It will be noted that in each of the five above mentioned cases the physical signs and symptoms are practically the same. More or less suddenly a man previously healthy experiences pains in the foot, ankle and calf, together sometimes, with cramps of the muscles, which cause him to stop, and if he looks at the foot he finds it to be cold and bloodless. On resting, however, the pains gradually disappear and the colour slowly returns in red patches which ultimately run together. On resuming the walk, however, the symptoms return so that it becomes impossible for these patients to walk any distance. Physical examination reveals nothing except an absence of pulsation in the dorsalis pedis and generally also in the posterior tibial artery. The muscles are often very well developed and there is no sign of any affection of the nerves. As a rule only one leg is affected, but both may become involved. Nothnagel has related a case in which one arm was affected and the late Dr. Dreschfeld told me he had also seen an arm affected with the disease.

History. The history of this affection is very interesting. As pointed out by Osler in his lectures on angina pectoris (p. 115), Allan Burns in his "Observations on some of the more frequent and important diseases of the heart" (published in 1809), states in illustration of the view that angina pectoris is caused by atheroma of the coronary arteries that "if we call into vigorous action a limb round which we have, with a moderate degree of tightness, applied a ligature, we find that then the member can only support its action for a short time; for now its supply of energy and its expenditure do not balance each other; consequently it soon, from a deficiency of nervous influence and arterial supply, fails and sinks into a state of quiescence."

M. Bouley, Junior (*Arch. gén. de méd.* Vol. xxvii., p. 425, 1831), made some observations on what he described as inter-

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mittent claudication (the first time the term is used) occurring in a mare aged six years. The attacks came on suddenly after a few minutes exercise and were caused by an obliteration of the femoral arteries. As long as the animal was in repose, the blood could arrive by the collateral vessels, but when it trotted these vessels could no longer transmit enough blood and the members were struck with numbness and deep pain.

This condition is, it seems, well known to occur in horses and is called by the French veterinary surgeons "boiterie." Charcot published a memoir on intermittent claudication in 1859 (*Mem. de la Soc. de biol; and Gaz. méd. de Paris*), and in this he gives a vivid description of the sufferings of horses affected with this malady, the symptoms being practically the same as those occurring in man.

But previously to this, Sir Benjamin Brodie in a lecture on "mortification" published in 1846, says "if you cross-examine a patient who has mortification of the toes, he will generally tell you, that for three or four years preceding, he has had occasional pains in the lower limbs; a sense of numbness in them, that his feet were liable to be cold; that when they again became warm, after having beeen cold, they have been very painful; and that he has had a sense of weakness of the muscles. Such patients walk a short distance very well, but when they attempt more than this the muscles seem to be unequal to the task, and they can walk no further. The muscles are not absolutely paralysed, but in a state approaching to it. The cause of all this is sufficiently obvious. The lower limbs require sometimes a larger and sometimes a smaller supply of blood. During exercise a larger supply is wanted on account of the increased action of the muscles; but the arteries being ossified or obliterated, and thus incapable of dilatation, the increased supply cannot be obtained. This state of things is not peculiar to the lower limbs. Wherever muscular structures exist,the same cause will produce the same effect. Dr. Jenner first, and Dr. Parry of Bath afterwards, published observations which were supposed to prove that the disease which is usually called angina pectoris depends on ossification of the coronary arteries." Brodie further says "when the coronary arteries are

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in this condition (of ossification) they may be capable of admitting a moderate supply of blood to the muscular structure of the heart—but whenever the heart is excited to increased action —then the ossified arteries being incapable of expanding so as to let in the additional quantity of blood required, its action stops and syncope ensues; and I say, that this exactly corresponds to the sense of weakness and want of muscular power which exists in persons who have the arteries of the legs obstructed or ossified." It will be seen that the above is an excellent description not only of intermittent limp but also of its causation.

Charcot (*Le Progrès Médical*, 1887. Vol. ii., pp. 99 and 115) again discusses the affection and mentions two fresh cases. Since then many cases have been recorded from time to time and the disease discussed in all its aspects and especially by Potain, Goldflam (who has many papers on the subject since 1895, *Deutsch. med. Woch.*, p. 36), Erb and Oppenheim; and on the pathological side by Parkęs Weber, Pearce Gould and others. There is a particularly good article by Grassmann in v. Ziemssen's Festschrift (*Deutsch. Arch. f. klin. Medicine.* Vol. 66, p. 100).

Ætiology. This condition is almost only found in men between the ages of 25 and 50 years. So far as can be judged from a considerable number of recorded cases neither syphilis, gout, kidney disease nor diabetes is a causal agent, although such diseases have been met with as coincidences in different cases. Nor does it generally form part of a generalized arteriosclerosis. Erb thought that excessive tobacco smoking was a strong factor in its production and although two of my cases were non-smokers it would seem very probable that tobacco may be a predisposing cause. Jews are said to be specially liable to be affected, but I have never yet seen a case in a Jew. Goldflam has found in some cases that more than one member of a family was affected, and in others he thought there was an inborn predisposition to the disease.

Course and prognosis. The condition may last for years with but little if any sign of improvement. But if care be not taken to avoid over-exertion the symptoms get worse and in not

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a few cases gangrene has ensued requiring high amputation and this is one of the reasons why the disease should be recognized as early as possible.

Pathological anatomy. This affection is practically always associated with narrowing or actual obliteration of the arteries supplying the limb, and this may even extend into the smallest branches of the vessels. In some case the vessels supplying nerves were affected with some degeneration of nerve fibres, but as a rule the nerves and muscles were healthy. The change in the vessels consists of a very definite obliterative endarteritis such as will be found illustrated in the article by Michels and Parkes Weber in the Transactions of the Pathological Society of London, Vol. 56, Pt. ii., 1905. In some cases large or small calcareous masses have been found in the vessel wall; and Saenger and also Ramsay Hunt (*Medical Record*, May 27th, 1905) have been able to show the calcareous change in the artery by skiagraph.

Pathology. The history of this disease shows how closely similar it is to angina pectoris due to narrowing or obliteration of the coronary arteries. Burns in discussing angina pectoris shows how similar symptoms can be produced by a slight ligature applied to a leg which is then put into action; and Brodie gives a good description of the disease as due to obliteration of the arteries of the legs and shows how similar this is to angina pectoris. The pathology of the two affections is practically the same, and indeed intermittent limp might almost be called "angina cruris." While the limb is in repose the blood in the collateral vessels is sufficient, but as soon as the muscles are put into action and require more blood, the pain and cramp are set up and at the same time there is a lessened amount of blood in the superficial structures and the coldness and intense pallor of the limb occur. It has been assumed by some that during the attack an actual spasm of the vessels also occurs but it does not seem to me to be necessary to assume this.

Treatment. Unfortunately but little can be done in the way of treatment. Potassium iodide and nitrites are more or less useless. Possibly massage may be of service to improve

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the local circulation. Certainly tobacco should be eschewed; the limb must always be kept warm and the foot never compressed by tight boots. It is very important that such over exertion as will bring on the pain should be avoided as far as possible.

The reason why I have ventured to bring forward this already well described condition is that just as Charcot said in 1887 that the disease was not sufficiently well known so I still believe it is but seldom recognized, and that considering I have seen no less than five cases in two years it must be commoner than is usually supposed.

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HYPERPLASIA OF SUPERIOR MAXILLA.

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With remarks by
F. A. SOUTHAM, M.B. (Oxon.), F.R.C.S. (Eng.),
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THE cases which I wish to describe here illustrate a condition which is not commonly met with, but which does occur from time to time, and gives rise to serious thoughts when first seen as to its nature and as to the appropriate treatment to be adopted.

In the first place, the hyperplasia is one of bone and perhaps may be called, for descriptive purposes, a hyperostosis, to signify that the changes which occur are limited to the bone itself. The clinical aspect is more likely to come under the notice of the dentist than the surgeon, for either as a factor in its causation or as an accompaniment, we find that in the majority of these cases there is a more or less extensive caries of the teeth. It may be the slowly increasing swelling of the upper jaw, or the pain which will determine the sufferer to seek the aid of the dentist. The swelling is found to effect, primarily, both walls of the alveolus; presenting a much broader appearance than the opposite side. From thence it spreads to the outer wall of the superior maxilla. At the same time, it more or less, fills up the maxillary antrum. In no case have I found it to invade the nasal or orbital fossæ. The pain is generally referred to the distribution of the superior dental nerve when due to the pressure of the growth on the nerve trunk, or it may be limited to the exposed nerve endings in the carious teeth. In all cases, however, the pain is not of a very severe character, and differs in this respect from that due to malignant disease.

The models, from which the first illustration is taken, were taken from a case which I operated upon at the Dental Hospital

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some two years ago. The patient was a servant girl, age 19, who had suffered pain and discomfort with her teeth in the posterior part of the left upper jaw (Fig. 1). As will be seen there is a smooth swelling affecting chiefly the external wall. It was hard on palpation and gave a shadow on transillumination. It also was observed to be bulging in the canine fossa above. There was no affection of the eye or nose. I made a longitudinal incision over the alveolus and found a very thin layer of compact bony tissue, which however was somewhat porous in character, and beneath this I came upon cancellous bone, very vascular, and which, with a gouge, cut with the consistency of a potato. I found that the whole of the antral cavity was filled with this material, and I removed all that was possible with the gouge as far back as the tuberosity and forward as far as the canine tooth. As the tuberosity was not much enlarged it was left. I then packed the cavity with gauze. An impression was taken in wax, and a denture to cover the opening made in the workroom of the hospital; the gauze was replaced by the plate and subsequently fresh plates were made on two occasions to accommodate the shrinkage of the tissues. She made an uninterrupted recovery and was able to dispense with the plates in eight weeks after the operation.

This patient came to me again in September of this year, nearly three years after operation, with difficulty in closing the teeth owing to swelling of the tuberosity, she had had no neuralgic pain since the operation, and only the pressure of the lower teeth on the swollen tuberosity caused pain. The other parts of the jaw had remained unaltered. I removed the tuberosity by a transverse section, after turning back the soft tissues, and found the bone to be similar in structure to that previously removed. The wound healed in three weeks.

The pathological report was kindly made for me by Dr. I. Walker Hall, now Professor of Pathology in the Bristol Medical School. In his report he says:—

"The tissue consists of well formed bony tissue. The laminæ of bone are already laid down, and the bone corpuscles stain well. The interstices of the bone are occupied by a thick layer of actively proliferating osteoblasts, amongst which are

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Fig. I.

Fig. II.

Superior surface of Maxilla excised showing the antral cavity filled with cancellous bone.

Fig. III.

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a few osteoclasts. In addition, there is a rich vascular supply, and an abundance of connective tissue cells; these cells possess an unusually large amount of protoplasm. There are no collections of small cells or polynuclear leucocytes, nor are there any signs of granulomatous inflammation. The condition appears to be one of simple hyperplasia."

It will be seen from this report that the condition is benign in character and justifies the opinion that the appropriate treatment is to remove the cancellous bone as far as it extends. Excision of the upper jaw has usually been performed, and, although at once a radical and effective procedure, I believe that the less radical form of operation will be found to effect a cure.

Another case which came under my care was that of a young man, 27 years of age. He had a similar condition of swelling of the inner and outer walls of the alveolus, and two or three carious roots on the left side of the superior maxilla. He said he had noticed the swelling for eighteen months or two years, and had a constant "toothache" in the bone. The carious roots were extracted but the pain and swelling continued, and although the width of the alveolus had not apparently increased yet the canine fossa was more prominent than five months before. I opened up the alveolus and found some cancellous bone incompletely filling the antrum, but easily detected the cavity above the swelling which was smooth on the convex surface. The cavity was closed in about two months and for the past two and a half years there has been no recurrence.

The third case was that of a woman, aged 25, who had noticed the swelling in the left upper jaw for some months, and thought it to be due to a carious bicuspid tooth. The tooth having been removed the socket was found to be surrounded by spongy bone, and a steel probe could penetrate easily in all directions. There was some vascularity but nothing remarkable. The condition remained stationary for about six months, up to when I last saw her in June, 1907.

There seems to be a very scanty amount of information to be obtained on looking up the literature on the subject and, as I have had the opportunity of observing three cases, and also through the kindness of Mr. F. A. Southam, Senior Surgeon

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of the Manchester Royal Infirmary, have been able to examine a beautiful dry preparation which he lent me to make a reproduction (Fig. 2. and Fig. 3). He has also arranged, for comparison a normal maxilla (Fig. 4). In this case Mr. Southam appends the following history :—

" The patient, a girl of 19 years of age, received a blow on the left cheek 9 years before, which was followed by a slight swelling which, however, never entirely subsided. About February, 1902, the swelling slowly increased in size, and in February, 1904, when she was admitted to the Manchester Royal Infirmary the swelling had become more rapid for some weeks. Some weeks before admission, she had severe neuralgic pain in the side of the face, and it was for pain and disfigurement that she sought relief. The enlargement of the jaw appeared to be solid and hard in consistence, and opaque on transillumination. Neither the nasal fossæ, nor the orbit were encroached upon."

Mr. Southam excised the upper jaw, leaving the orbital plate. The recovery was quite satisfactory and there has been no recurrence of the growth.

I have had the opportunity of seeing two other cases—one a relative of my own, a young lady 17 years of age whom Mr. Southam operated upon by gouging away the cancellous bone, seven or eight years ago, and in whom there has been no recurrence, the other a woman, aged 30 years, a domestic servant, sent to Mr. Southam by Dr. MacMillan, of Prestwich, who had a similar affection of the left maxilla. Fig. V. is a reproduction of the model taken of this case. She has had a steady enlargement for the past four years with occasional pain of a neuralgic character; but otherwise the inconvenience was one of disfigurement only. The swelling is chiefly encroaching upon the canine fossa below the molar process. There are three carious roots of the twelfth year molar to be seen.

From a study of these cases, I have come to the conclusion that this bony growth is simply a reversal of the process of formation of the antrum or of the absorption of bone which takes place during childhood. From some continued irritation, either from an injury, or from caries of the teeth, the bone-developing elements become unusually active; the osteoblasts rapidly in-

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Fig. IV.

Fig. V.

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crease in number and form new spongy bone. The osteoclasts cannot keep pace with the increase, but are seen in microscopical sections to be accompanying the osteoblasts in all the spaces of the bone. The line of least resistance being, in most cases, the antral cavity and the two thin layers of compact bone of the alveolus, we get a slow filling up of the antrum and it is not until this cavity is filled that any serious pain or disfigurement arises.

The final condition of the superior maxilla is an exaggeration of that usually met with before the antral cavity has formed.

The age at which these cases are met with is usually between 17 and 30 years.

In all cases that I have examined only one has occurred in a man, the others being all in young women, and all being in the left maxilla.

The diagnosis from sarcoma lies in the absence of continuous pain, limitation to the maxilla, and absence of recurrence, as well as the microscopic appearances of the bone.

Should any similar cases be met with in the left maxilla, it would be as well to have an exploration made and a specimen of the bone examined microscopically before resorting to the radical operation of removal of the whole maxilla, and as these cases are not common, it would be of great interest if any such were reported upon when met with.

REMARKS BY MR. SOUTHAM.

Mr. Westmacott has so fully discussed the pathology and clinical history of this somewhat rare condition, that I have not much to add. In a fourth case which has come under my observation and not included in the preceding, the patient was also a female, and aged 25 years, but it differs from those described in the fact that the right upper jaw was affected. The enlargement had been first noticed about three years previously, and had progressed very slowly, causing no pain or inconvenience. All the teeth were absent from the affected jaw. As in the other instances, the enlargement affected the alveolar and

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palatine processes of the superior maxilla, and also the lower part and anterior wall of the antrum, so that the cheek was rendered unduly prominent, and it was in consequence of the disfigurement of the face that the patient sought advice. In order to correct the deformity, the lower half of the jaw was removed. The result of the operation was very satisfactory, but the subsequent history of the case is not known.

Diagnosis. There is not as a rule much difficulty in diagnosing the nature of this condition, its slow progress, the uniform enlargement of the bone, its firm consistence, the fact that the mucous membrane retains its normal appearance, and the absence of any inflammatory phenomena, especially of tenderness upon pressure, and of freedom from pain in the early stage,—all indicating that it is not an inflammatory swelling due to periostitis, or a new growth.

In a dentigerous cyst, the swelling is more localised, and as it enlarges, a sensation of elasticity, or of "egg-shell" crackling upon pressure, can often be detected. If any doubt exists, an exploratory puncture will reveal the existence of fluid, and a radiogram may show the presence of a misplaced tooth, which is a common cause of the trouble, when a cyst of this nature has developed.

A simple or malignant epulis is hardly likely to be mistaken for this condition, nor is suppuration within the antrum, nor hydrops antri. A sarcomatous growth originating within the antrum may in the early stage be more difficult to distinguish from simple hyperplasia, but the more rapid progress of the former, its softer and more elastic consistence, often unequal in places as it increases in size, and its tendency to extend irregularly in one direction more than another instead of producing an uniform enlargement of the jaw, will usually indicate its true nature.

In hyperplasia, the condition again is very different to that met with in Leontiasis ossea, a rare affection characterised by a diffuse and irregular overgrowth of osseous tissue, springing from the bones of the face and cranium, and not infrequently originating in the upper jaw. Like the hyperplasia described, it generally commences in young adults, but differs in the fact that

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the affected bone instead of being uniformly enlarged, becomes irregularly increased in size by the development of nodular protuberances of osseous tissue, which spring from its surface and project beneath the skin, causing a characteristic disfigurement of the face, hence the term applied to this affection. The condition of diffuse hyperostosis more or less rapidly spreads to the other bones of the face, and also to those of the cranium, encroaching on the different cavities, and sooner or later proving fatal from pressure effects.

Treatment. The case reported by Mr. Westmacott, and the result in one of my patients, show that in the early stage the progress of the hyperplasia may be arrested by trephining and freely removing the bone by means of a gouge. When, however, the hypertrophy is so considerable that it causes a marked deformity of the cheek, then a more extensive operation may be required and under these circumstances removal of the lower portion of the jaw gives a satisfactory result. The resulting scar is very slight, and as the orbital plate of the superior maxilla can be left, there is no subsequent deformity from falling in of the cheek, especially if a well-fitting artificial plate is afterwards worn.

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ON THE ORAL, LARYNGEAL AND NASAL SYMPTOMS OF MYXŒDEMA.

By SIEGMUND MORITZ, M.D., M.R.C.P. (Lond.),

Senior Physician to the Manchester Hospital for Consumption and Diseases of the Throat and Chest; Lecturer on Laryngology and Rhinology in the Victoria University of Manchester.

THE last paper which Dreschfeld read in public was on Myxœdema;[1] a contribution to the symptomatology of this disease did therefore not seem out of place for this, his Memorial number. When I promised a paper on the laryngeal symptoms of this disease to the Editor I laboured under the mistaken idea that a myxœdematous affection of the mucous membrane of the upper respiratory tract had hitherto not at all or only rarely been observed. I was confirmed in this belief, as it was unknown to Dreschfeld, to whom not many medical facts were unknown, and as several other physicians, who had seen cases of myxœdema, were equally unacquainted with the symptoms, I am here bringing forward. The *Handbuch der Laryngologie,* by Heymann (Berlin, 1898, in 5 vols.), rightly considered the Encyclopædia of Laryngology, also mentions nothing in regard to a myxœdematous condition of the nose or larynx, and other text-books on laryngology are equally silent on this subject.

But when I came to take a more accurate survey of the literature, I found that a number of cases of myxœdema with symptoms from the nose, larynx, etc., have been described, still as they seem little known generally, I may be allowed to add the record of my case to those hitherto published:—

Some years ago I was called to see a lady, aged about 65, who complained that her tongue was getting too large for her

1. Before the newly formed Association of Hospital Physicians in London.

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mouth. Unless she took great care she would bite her tongue. She had worn artificial teeth, which had been repeatedly altered, as they did not seem to fit and got in the way of the tongue; and finally, she had to give up wearing them altogether as she felt more comfortable without them. At nights he would sometimes be awakened by a choking sensation, the tongue seeming to impede her breathing.

On inspection the tongue appeared very voluminous, but there was no sign of any inflammation, no abrasion, no ulcer; it was simply and uniformly enlarged. The speech was somewhat thick, but the movements of the tongue were normal. It seemed a large and fleshy tongue, perhaps not even much larger than one occasionally meets with in cases where no complaint is made or discomfort caused.

The lady was a very stout, but otherwise healthy-looking person, and the tongue was the only source of complaint. I saw the patient two or three times within a few months and the condition remained unaltered.

Four or five years later I was called to see the same patient with Dr. Fulton, of Cheetham Hill. The patient had been ill and laid up for several months. She had, though still very stout, become very decrepit and weak. Her hair had fallen out, she was in a peculiar semi-demented condition, she would frequently pass urine under her, etc. Most troublesome was the breathing; she would sleep with her mouth open, protruding the tongue, and she complained about her nose feeling stopped up and her throat feeling tight. When asleep she would snore unmercifully, to the annoyance of everyone in the house. Her speech was thick, the voice monotonous and somewhat hoarse. The heart-sounds were weak, the urine free from albumen. The skin of the face, hands, arms and legs seemed swollen and tight, but did not pit on pressure. It was a characteristic case of myxœdema, as was also shown by the beneficial effects of thyroid gland tabloids, which brought—at least temporarily—great improvement.

The patient died several months later from increasing weakness, unfortunately no autopsy could be obtained.

Now, about the condition of the upper air passages, of which

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I was able to make an exhaustive examination. The nose externally seemed normal, a large and well-formed nose. The septum normal, mucous membrane not thickened, no deviation. The mucous membrane over the lower and middle turbinals was pale and much swollen, *did not contract on painting with cocain and adrenalin,* though it felt soft to the touch of the probe. The laryngeal examination, somewhat difficult on account of the size of the tongue, revealed the mucous membrane of the pharynx swollen and thick, the uvula thick and large, but not œdematous looking. The epiglottis swollen and enlarged, pale. The coverings of both arytænoids symmetrically swollen; the thickened interarytænoid mucous membrane prevented the cords from closing during phonation; the cords were scarcely visible, being overlapped by the swollen ventricular bands. There also appeared to be some subglottic swelling, but with the difficulties of examination, one could not make quite certain of this. The naso-pharynx, as far as one could see it, seemed normal.

The peculiarities of this case were the early affection of the tongue, preceding other symptoms of myxœdema for years, and the extent and distinctness of the myxœdematous affection of the mucous membrane of the nose and larynx giving rise to troubles which predominated over the other symptoms of the disease.

As mentioned before, a number of cases of myxœdema, in which the nose or larynx were affected, are recorded, among the first to draw attention to these symptoms having been Sir Felix Semon, who, in a short editorial in the *Intern. Centralbl. für Laryngol.,* May, 1887, says that: "Considering the increased interest which is at present everywhere manifesting itself in myxœdema, the Editor begs to draw attention to the fact that cases of this disease may, in the first instance, come under the observation of the laryngologist or rhinologist. In the course of the last two years I have been consulted by three ladies for nasal obstruction, accumulation of mucus in the naso-pharynx and throat, a feeling as if the tongue was too large for the mouth; further, on account of the characteristic slow articulation and the leathery, dull voice. In these patients an examination showed not only a smaller or larger degree of general thickening of the mucous membrane of the upper air tract, but also that this

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thickening was only a part of the general swelling characteristic of myxœdema.

Not only have the text-books on laryngology almost without exception overlooked Semon's remarks, and do not mention the condition, but the chapters on diseases of the nose and larynx in Clifford Allbutt's *System of Medicine* (vol. iv.), written by Sir Felix Semon and Dr. Watson Williams, though they give a description of the laryngeal changes seen in a case of acromegaly, do not mention, as far as I can find, those occurring in myxœdema. One of the latest treatises on diseases of the larynx, a small and excellent little book, by Harold Barwell (*Diseases of the Larynx*, London, 1907), mentions that the author had seen, "in a case of myxœdema, a smooth œdematous-looking swelling of the arytænoid and interarytænoid region; it prevented the proper approximation of the cords, and may be the explanation of the husky voice in this affection."

E. G. West (*Boston Med. Journ.*, 1884) observed in a case of myxœdema, that the lips and mucous membrane of the mouth and tongue were swollen and also the vocal cords and ventricular bands. He ascribes the sudden death of his patient to the laryngeal œdema.

In my own case, and in most others recorded, the vocal cords were found free from swelling, though Hun and Prudden (*Internat. Journ. of Med. Sciences*, 1888) mention in three cases of myxœdema which were laryngoscopically examined, a swelling of the mucous membrane and thickening of the vocal cords and their insufficient approximation during phonation. The mucous membrane of the pharynx was pale, the tongue swollen.

Farlow (*New York Med. Journ.*, 1896) describes a case of myxœdema of the throat; the tongue was swollen and thin (*sic!*) and tended to protrude. The soft palate, uvula and posterior pillars of the fauces were very much swollen, tense, thin (*sic!*), rigid, smooth, symmetrical and the two sides equally affected. The colour pale. The same condition was present on the posterior pharyngeal wall extending into the post-nasal space. The swelling did not reach much below the tip of the epiglottis. There was nothing abnormal in the larynx. The speech was slow and indistinct.

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On diligent search a larger record of cases may no doubt be collected. The laryngeal and nasal symptoms of myxœdema are, I find, mentioned in some of the larger handbooks on medicine, in contradistinction to the special text-books which seem to overlook them. Thus in *Eulenburg's Encyclopædia* (2nd ed., 1888): "The mucous membrane of the mouth is simultaneously affected in myxœdema, the gums are swollen and bleed easily, the teeth become loose and fall out, the great infiltration of the tongue and palate make speech difficult, the voice becomes rough, the larynx is thickened." Thus also Gaucher in Brouardel's *Traité de Médecine*: "The mouth is kept open, the mucous membrane of the tongue, palate, gums, pharynx and larynx are affected. These alterations make speech difficult, the voice is slow, its timbre roughened." Ewald, in *Nothnagel's Handbuch* (vol. xxii., 1896), says: "The tongue is thick and voluminous, marked on its margins by impressions from the teeth, otherwise red, moist and clean. . . . In a few cases the uvula and posterior pharyngeal wall were swollen, also the arytænoids and interarytænoid region, as well as the ventricular bands." Kinnicut notes a chronic hypertropic rhinitis.

In Clifford Allbutt's *System of Medicine* (vol. iv., p. 470, 1897) Ord mentions the loss of timbre in the voice, its leathery character, doubtless due in part to obvious thickening of the fauces and the larynx, but still in no way resembling the character of voice observed in ordinary swellings of these parts; and further (p. 472): "The same swelling which is seen in the skin affects the mucous membrane. The inside of the lips and cheeks is tumid and is very apt to be bitten during mastication. The soft palate is generally found swollen to translucency and with great decrease of mobility. The speech is altered in so uniform a way that a diagnosis may almost be made when a patient, unseen, is heard talking. The words come very slowly and deliberately, the voice is monotonous and of a leathery timbre, no doubt much determined by the swelling of the throat, and is evidently produced with considerable effort owing to the swelling of the lips, etc.; there is probably a nervous as well as a mechanical cause for this change of speech."

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In the exhaustive " Report of the Committee of the Clinical Society of London to investigate Myxœdema " (London, 1888): In 70 cases the " throat " was once the part first affected (the tongue is not mentioned); in a total of 104 cases changes in the speech were marked in 100, in 4 they were absent; nose and smell were normal in 36, smell impaired in 11, perverted in 1, watery discharge from nose in 6 cases (in a total of 54 cases). Congestion of the vocal cords was seen in 1 out of 70 cases; no other laryngeal symptoms are mentioned. The tongue was normal in 28 cases, large, swollen and flabby in 52 (in a total of 91); the uvula and soft palate normal in 17, swollen, elongated, stiff and indurated in 31 (in a total of 48). Hæmorrhage from the throat was seen in 1, and from the nose also in 1 case.

It thus appears that nasal, pharyngeal and perhaps also laryngeal symptoms may not by any means be rare in myxœdema, and that it is desirable that all cases of this disease should be examined in this respect. It may be that not only the special symptoms are overlooked by the general physician, but also Semon's warning should be kept at heart by the specialist in the interpretation of cases similar to the one recorded. Further observations can only show whether the fact, observed in my case, that the swollen mucous membrane of the nose did not retract on the application of cocain and adrenalin can in any doubtful case be of diagnostic value. That this is probable seems likely from the pathological changes which we may assume to be present in the myxœdematous mucous membrane. The reports on the microscopic examination of such mucous membrane are sparing and of older date, so that a re-investigation seems most desirable. The changes described are an infiltration of the connective-tissue by an almost transparent or faintly granular material, separating the fibrils and increasing greatly the bulk of the connective-tissue in all its parts. This substance is a mucin-yielding modification or infiltration of the connective-tissue (Ord, in Clifford Allbutt's *System of Medicine*).

A more exhaustive description of the microscopic changes observed in the cutis from a case of myxœdema is given by Unna in Orth's *Handb. d. pathol. Anatomie,* 1894 (8th vol., pp. 1004—1010); a similar examination of myxœdematous

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mucous membrane with the more recent staining methods and reagents employed by Unna would be most desirable.

According to Unna the myxœdematous cutis shows an increase of elastic and a diminution of collagenic tissue. Unna's preparations showed no cell infiltration or leucocytosis, though all parts of the cutis were a little richer in cells than normal. The cells appeared poor in protoplasm, spindle-formed and the nuclei rod-shaped, changes observed by Unna in cutis subjected to pressure.

On staining, a displacement and diminution of the collagen fibres, and an increase of elastic fibres can be observed, but both these fibres show changes from the normal in their behaviour to several stains and reagents; they have become distinctly basophile, showing, according to Unna's nomenclature, that the elastin has been converted into elacin and the collagen into collacin, a conversion, according to Unna, highly characteristic of a deep degeneration of the connective-tissue, which, according to him, is sufficient to explain its swollen and bolster-like aspect. In addition Unna observed in the swollen, succulent and quasi-œdematous papillary layer, and also in other parts of the cutis, peculiar amorphous, cloudy and also formed, crystalline infiltrations, which assume the stains characteristic for mucin.

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THE MEDICAL CHRONICLE.

A MONTHLY RECORD OF THE

Progress of Medical Science.

THE SYMPTOMS DUE TO CERVICAL RIBS.

By WILLIAM THORBURN, F.R.C.S.

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IT is peculiarly appropriate that a volume issued to commemorate the work of the late Julius Dreschfeld should contain some account of this subject, as it is indirectly due to him that attention has been prominently called to its importance. In 1903 I operated upon a case of Dreschfeld's, who first pointed out to me how little was known of the condition by neurologists and who urged me to collect and publish certain records which I had previously made. These were embodied in a paper presented to the Royal Medical and Chirurgical Society in April, 1904, and published in their transactions in the following year. On June 1st, 1904, Seiffer published in the Neurologisches Centralblatt a careful and complete account of nervous symptoms resembling those in my own cases and due to a cervical rib, and since then several important papers have appeared, notably in England those of Lewis Jones ("Medical Electrology and Radiography," September, 1906), and Hinds Powell ("Lancet," June 22nd, 1907), in America that of Keen ("American Journal of the Medical Sciences," February, 1907), and in Germany an Inaugural Dissertation of the University of Strassburg (1905) by Schönebeck. The older scattered references to the subject have been collected by the two latter authors, while Lewis Jones and Hinds Powell have confirmed and amplified my original descriptions.

It is truly remarkable how totally this by no means uncommon source of serious nervous troubles had been ignored until three years ago. Thus Keen states "I had never seen

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a case of recognised cervical rib until October 20th, 1905. Within less than a month I saw four other suspected cases, of which two proved not to be cervical ribs and two others were." Lewis Jones finds that of fourteen cases which he had previously published as examples of "symmetrical atrophy of the hands in young people" ten really belong to this category. Hinds Powell has recently collected sixteen cases. Previously to my communication to the Medico-Chirurgical Transactions I had met with only four cases, but since then many others have been brought to my notice.* It would almost seem as if in connection with obscure affections of the brachial plexus the offending rib was to play a part similar to that of the vermiform appendix in relation to peritonitis, the same general but widely spread knowledge having, after a long period of neglect, proved suddenly to be the key to numerous difficulties.

Anatomy.

The anatomical and morphological relationships of the rib were fully investigated by Wenzel Gruber (1869), Sir William Turner ("Journal of Anatomy and Physiology," 1870, p. 131), and Lane ("Guys Hospital Reports," 1883 and 1884), and on these matters there was little left for us to learn. More or less well developed ribs are not infrequently met with in connection with the seventh cervical vertebra, the condition being generally bilateral; in very rare cases the sixth vertebra also carries ribs and four may thus be present in one neck. Occasionally the "rib" is a mere epiphysis, articulating only with the transverse process of the vertebra, but more commonly it is a developed anterior transverse process and consists of a defined head, neck and tubercle, with or without a body. If no body be present it does not project beyond the transverse process of the vertebra, but in the more fully developed cases it extends outwards, or forwards and outwards, into the posterior triangle of the neck where it may terminate in a free end or may join the first dorsal rib, the first costal cartilage or the sternum.

Posteriorly the rib articulates in the usual manner with the body and transverse process of the seventh cervical vertebra.

* I am much indebted to Dr. Bythell for radiograms and notes of several cases with slight symptoms.

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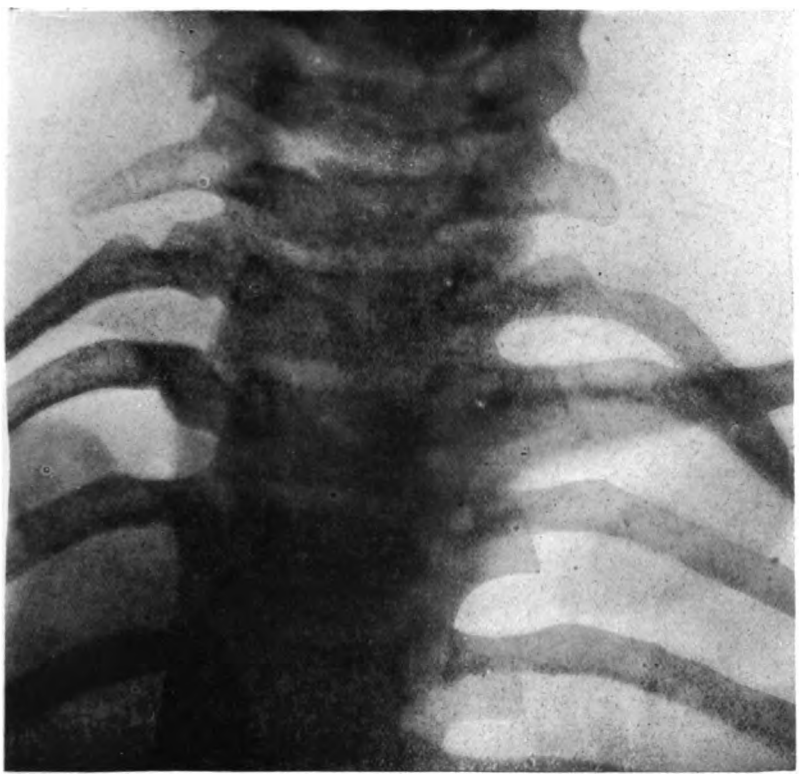

Fig. 1. Double cervical ribs from case of spinal caries with torticollis (Dr. Bythell).

Fig. 2. Cervical rib excised from case ii. Drawn by Dr. W. E. Fothergill.

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When it terminates in a free end it is bony throughout; to the first dorsal rib it may be united by dense fibrous tissue or by a joint with an articular cartilage and synovial membrane: junction with the sternum is by cartilage which unites with the first dorsal cartilage. The first dorsal rib often bears a well defined bony tubercle with which is articulated the distal end of its cervical companion.

The *shape* of the rib varies much in different cases: in some it is long, thin and pointed as shown in a radiogram given to me by Dr. Bythell (Fig. 1.); in others it is broad and flat, very closely resembling a first dorsal rib, and when thus flattened its edges are often very sharp (Fig. 2); when large enough and so placed as to lie in contact with the brachial plexus or subclavian artery it often presents on its upper border a groove for the lodgment of these structures. The *length* presents as great a variation as the shape; thus the abnormal bone may be so short as only to project slightly beyond the cervical transverse process, or it may curve round the neck, running a course of some inches before it joins the sternum or first dorsal rib. In this connection skiagrams are naturally quite misleading, as a short rib standing horizontally outwards will be very prominent, whereas a much larger bone, if flat and curved upon itself, will be comparatively inconspicuous, as shown by a comparison of the skiagram and the bone removed in case ii. (Figs. 2 and 3). Of equal importance with the size and shape of the rib is its *direction*: when running outwards it will completely avoid the nerves and vessels of the neck and will not produce clinical symptoms other than deformity; it is only when the bone curves round in the posterior triangle that it is liable to lead to trouble, and its shape and direction are thus doubtless of more importance to the clinician than its mere size. It is also important to note in operating that the posterior end of the rib lies a good deal higher in the neck than might be anticipated, the seventh cervical vertebra being only a short distance below the cricoid cartilage, while the upper margin of the sternum is on a level with the lower border of the second dorsal vertebra: thus as the patient lies with the head extended the seventh cervical

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transverse process is high up in the posterior triangle. The *mobility* of the rib is also important for the surgeon and possibly in connection with the etiology of symptoms; where the bone has no anterior attachments its vertebral articulation allows fairly free movement, but when the arch is completed and there are connections with the first dorsal rib or sternum these are very strong and the bar is rigidly fixed at both ends. A condition of very complete fixation is shown in the accompanying drawing of a specimen kindly lent to me by Professor Young (Fig. 4).

The *muscular attachments* of the cervical rib are such as would be anticipated from its morphology. In well developed cases the anterior, and occasionally the middle and posterior, scalene muscles may be attached wholly or in part to the abnormal bone, and it is behind the insertion of the scalenus anticus that there will often be found a groove for the reception of the artery and plexus. An external intercostal and sometimes also an internal intercostal muscle may extend from the cervical to the first dorsal rib.

The *subclavian artery* only comes into relationship with the rib when the latter has a sufficient length and curve to reach the anterior part of the neck, but there is no absolute rule as to what this length must be, although attempts have been made to define it in centimetres. In all cases the artery, if it has any relation to the rib, passes *over* it and thus has an increase in length, the entire dome of the thorax being slightly raised by this additional bone.* The vessel is thus rendered prominent in the neck and it often presents a sharp bend where it passes over the rib; in a case of Keen's there was marked dilatation of the artery on the distal side of this bend, and in a good many other examples dilatation has been found in its vicinity. In cases in which the artery thus passes over the rib the scalenus anticus is generally attached to the latter, the vessel lying in the angle between them.

The *subclavian vein*, lying as it does much further forwards,

* In a remarkable case quoted by Schönebeck from Ehrich, in which both the sixth and seventh cervical vertebra carried ribs the artery passed between these. Struthers, (*Journal of Anatomy*, 1874) also records a case of ribs springing from the sixth and seventh vertebræ.

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Fig. 3. Double cervical rib from case ii.

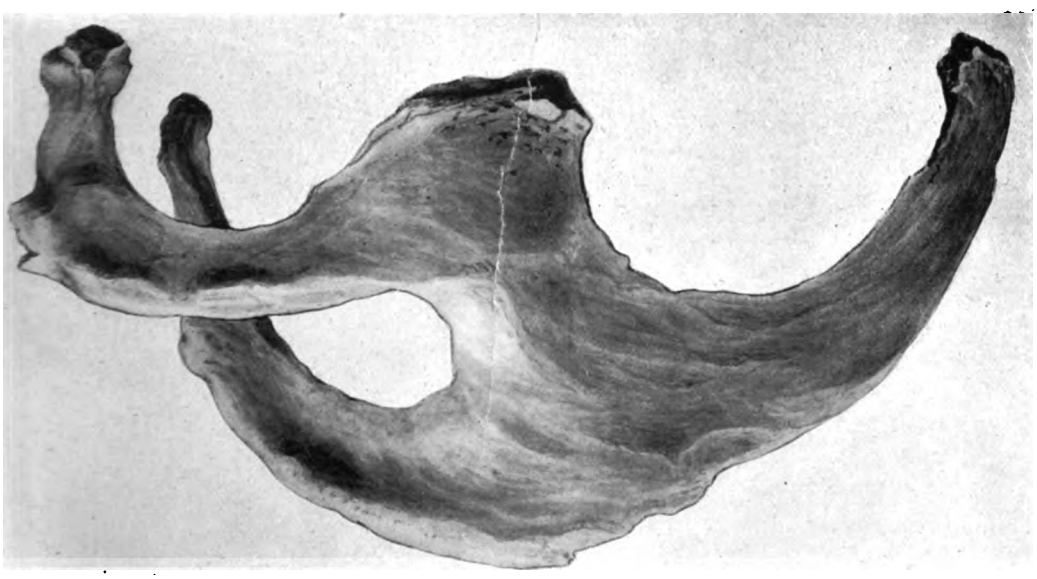

Fig. 4. Seventh cervical and first dorsal ribs from specimen lent by Prof. Young. Drawn by Dr. W. E. Fothergill.

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is less liable to be lifted up into the neck and is also not compressed against the scalenus anticus but can readily glide off the end of the rib whether the latter be free or be turned downwards to a fixed attachment. It is seldom if ever seen in operations and has hardly been referred to in dissections of these ribs.

The *brachial plexus,* lying behind the artery, always crosses the cervical rib in cases in which the latter does so. That the plexus may lie in a distinct groove was recognised by Gruber and Turner, while so far back as 1900 Llewellyn Phillips and Addison brought before the Anatomical Society of Great Britain and Ireland cases illustrating the passage of the nerves over a rib, which was attached at both its anterior and posterior ends. Numerous operations have also now placed beyond dispute the usual relationship of these structures, the lower trunk and inner cord of the plexus resting in more or less close contact with the abnormal bone. A much more rare arrangement obtained in a case quoted by Lewis Jones from an operation by Rawling in which a broad flat rib with a free anterior end passed between the 8th cervical and first dorsal roots, which united beyond it, the 8th cervical root being sharply kinked by the subjacent bone while the first dorsal had apparently escaped any pressure. It will, of course, be obvious that in all cases the plexus passes over the rib with a less sharp curve than is presented by the subclavian artery.

The *pleura* often extends high into the neck and is in the closest relation with the inner aspect of the rib. In such cases the cervical rib takes the place, and often the shape, of the first dorsal and determines a general raising of the dome of the thorax on the affected side.*

Clinical Effects.

Clinically the pressure of a cervical rib may be appreciated as a source of deformity in the neck, or as giving rise to

* Possibly some of the cases described clinically as cervical ribs are in reality ill-developed first dorsal ribs, but this distinction is of morphological rather than clinical interest and will not be further referred to. It is, however, unlikely that a first dorsal rib would press upon vessels or nerves and the first dorsal nerve root ought to lie well above it.

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pressure upon the brachial nerves or subclavian vessels. Bennett ("Lancet," June 8th, 1907) also reports a case in which the anterior end of a left cervical rib so pressed upon the clavicle as to cause dislocation of the sternal end of the latter, there being apparently no other inconvenience, and a similar observation is published by Schnitzler.

In some cases the rib is associated with scoliosis, torticollis or diseases of the spinal cord, but in such it can hardly be regarded as the cause of the co-existing symptoms.

Scoliosis has been frequently met with, Schönebeck having found it mentioned in 22 out of 61 collected cases, while Garré and Drehmann had previously noted the connection. Personally I have met with slight scoliosis in one case only, but Hinds Powell had one well marked and two slight examples in his 16 cases. In some of these instances it is undoubtedly quite accidental; thus in the only one which I have met with there could be no doubt that we had a slight lateral curvature of ordinary type due to inequality in the length of the lower limbs and probably to slight coxa vara.

Drehmann (quoted from Keen) has however shown that in some cases there are associated deformities of the bodies of the vertebræ, such as inequalities in the depth of the two sides or intercalated segments, and that congenital lateral curvatures are thus liable to be associated with abnormal ribs. Such conditions can, however, hardly be regarded as results of the presence of the rib and need not at present detain us. In other cases it is probable that lateral curvature is initiated by lateral deflection of the head to relieve pain, the head being approximated to the shoulder on the affected side and tension on the nerves being thereby reduced. *Torticollis* might naturally be produced by associated deformity of the vertebral bodies and was present in one of Drehmann's cases. In one of the cases communicated to me by Dr. Bythell there was marked torticollis, but this was regarded by Mr. Charles Roberts, under whose care the patient was in Pendlebury Hospital, as due to spinal caries, and the cervical rib is probably of no pathological importance although very prominent in the radiogram (Fig. 1).

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Lastly the co-existence of *syringomyelia* with cervical ribs has been noticed in several cases, but these two conditions cannot be regarded as standing in the relation of cause and effect; they are either incidentally associated or due to a common developmental error in the cervical region (Schönebeck *loc. cit.* Borchardt, Berlin, klin. Wochenschrift, 1901, p. 1265, etc.).

Vascular Symptoms.

Affections of the subclavian artery are generally manifested by changes in the radial pulse, and in nearly all cases in which nervous symptoms are produced the pulse will be found to be markedly weakened or even absent on the affected side, this symptom being a valuable and ready aid to diagnosis. The weakness of the pulse is not unnaturally relieved by raising the arm above the head so as to remove the sharp curve made by the artery passing over the rib, and in all my operation cases removal of the bone has removed the symptom. In the neck the subclavian artery is prominent and its pulsation, which is readily seen and felt, is often associated with a marked systolic murmur.

More serious results of pressue upon the artery have been met with. The simulation of *aneurism* by an artery raised up on a supernumerary rib has long been recognised, having been first recorded by Sir Wm. Turner (*loc. sup. cit.*) on the basis of a letter from Sir James Paget, but it is not quite certain that a true aneurism is ever produced by the presence of the rib. Dilatation has certainly been met with in several operations—generally on the distal side of the rib—but this usually subsides after operation and gives rise to no further trouble. On the other hand, Ehrich has recorded a case in which aneurism developed after operation, presumably as a result of injury to the vessel or withdrawal of support; such a condition might follow injury to the wall of any large vessel, especially in the somewhat forcible dissection required to remove a cervical rib; it presents therefore no peculiar relationship to the malformation we are considering, but it indicates the need for care in handling the vessel during operation.

Arterial thrombosis has, unlike aneurism, certainly been met

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with in several cases (Keen collects ten), and *gangrene* of the tips of the fingers has been noticed seven times, but these troubles have not come within my personal experience.

The subclavian vein seldom comes into close contact with the cervical rib, and, lying in front of the scalenus anticus, is not compressed in the angle between that muscle and the bone so that venous troubles are rare, but in a few cases—including one of my own (Case vi.)—œdema has been met with. Subjective and even objective feelings of coldness in the hand are not rare, but are probably due to pressure upon nerves, with or without, anæmia from arterial pressure, and reference will be made later to this symptom.

Nervous Symptoms.

Far more interesting than the above troubles are the *nervous symptoms* which result from cervical ribs, and it is to these that we may now more particularly turn our attention. It is in the first place clear that such symptoms are by no means present in all cases, and it is as impossible to say definitely in what proportion of cases they are present as it is to state what percentage of the population have cervical ribs. Of seventeen cases (fifteen females and two males) which have come under my personal observation thirteen presented some nervous symptoms, but such a proportion is obviously too high as it is generally only the existence of symptoms which has caused the rib to be sought for; in four cases in which no symptoms were present the condition was simply discovered by accident.

It has been argued, as in the discussion at the Royal Medical and Chirurgical Society, that in all cases the co-existence of symptoms with the rib was a mere accident and that the bony deformity could not be a cause of symptoms, but in view of the above figures, as well as of numerous collected observations, and in particular those of Lewis Jones, this position may now be regarded as untenable, especially as it is clearly proved that the removal of the rib cures the symptoms. On the other hand it must be agreed that some factor other than the mere existence of the rib is required to produce symptoms. Of these factors

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the purely anatomical ones of size and direction have already been noticed but our cases enable us to indicate certain others.

All my own (13) cases, with the exception of one presenting only slight pain, have been met with in women, as have the great majority of those recorded. In nine of the thirteen they were unilateral, in four bilateral, and of the unilateral cases six presented symptoms on the right side only and three on the left side only. This selection of the right limb is moreover not due to the special prevalence of the bone on that side, as in fifteen out of seventeen cases examined the rib was bilateral; in seven of the nine with unilateral symptoms it was also bilateral; and in one bilateral case the larger rib was on the side less affected (the left). We must, therefore, conclude that there is a special tendency for symptoms to affect the right upper limb.

The age of the patients presents wide variations, the earliest date at which I have met with them being the seventeenth year (Case vii.), the latest the seventieth (Case viii.). In spite of these extremes we find, however, a very definite tendency for symptoms to appear in early middle life. Thus in eight cases in which symptoms were severe the ages of onset were 17, 20, 22, 23, 27, 35, 46 and 50; in four, which present only slight pains, the date of onset is uncertain, but the cases when seen were aged respectively 45, 50, 60 and 72; in one remarkable case paralysis was produced in the right upper limb at the age of 20 and in the left at the age of 70.*

We may then fairly conclude that symptoms are much more common in the female, that they generally involve the right upper limb and that they tend to appear in early middle life. The sexual selection is peculiar and no satisfactory explanation has been given, but it should be stated that there is no reason in any of my cases to regard it as in any way neurotic or hysterical. The age of onset has generally been regarded as bearing some relation to the completion of ossification, and it is natural to suppose that this plays an important part in the production of pressure; possibly also the little group

* Symptoms are occasionally but rarely met with in children, Keen having collected six cases between the ages of seven and fourteen.

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of "senile" cases may be the result of changes in the shape or rigidity of the spine and thorax such as are usual concomitants of old age.

The special selection of the right upper limb points strongly to the more free use of the right hand as a determining cause, and it is obvious that, if the brachial plexus lies over the rib in a condition of moderate tension, the use of the limb may readily increase such tension. In this connection it may be noticed that one of my patients was a teacher of music while another was an expert pianist. The history of the evolution of symptoms in Case ii. is also striking; these first followed a wrench of the right arm; they were reinduced by a strain on getting into a train and a third time followed a fall on the right elbow; on the left side they came on in putting the arm into the sleeve of a coat. In each instance, therefore, it is probable that the shoulder was carried upwards and backwards, bringing the clavicle nearer to the rib—a mechanism similar to that which produces the typical Erb's paralysis or the "supra-brachial" type of arm paralysis. Still more suggestive of over-use of the limb as a cause of symptoms is Case ix.; in this, the only well-marked example which I have seen of symptoms confined to the left side, the rib was bilateral, but paralysis commenced at the age of 35, one month after the patient began to carry on the left arm an invalid child five years of age.

In conclusion we may say then that nervous symptoms do not occur in all cases; that they are far more common in women; that they are very rare in children; that the usual age of onset is about the 25th year, but that a second group of cases is met with in late life; that this age incidence is probably due to the completion of ossification or to senile rigidity; that the right arm is more commonly affected; and that injury or any strain plays an important part in the proportion of symptoms, especially when the clavicle is carried upwards and backwards.

Turning next to the nature of the symptoms we find that in nine out of thirteen cases these are purely subjective while in four only was there definite paralysis, atrophy or anæsthesia,

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and it will be convenient to describe the cases as forming two groups—the *neuralgic,* in which pain and subjectic weakness are alone complained of, and the *paralytic,* in which there is definite loss of power or sensation.

Neuralgic Cases.

In the great majority of these the one prominent symptom is pain, which may be felt in the neck or in the upper limb, but is much more characteristic in the latter; in a good many of these there is also a marked feeling of weakness or uselessness of the limb, and sensations of coldness or susceptibility to cold are also common.

Pain in the neck was complained of in only three out of thirteen cases, and none of these were severe examples or indeed of well-marked type. In one it was the only symptom and may perhaps not have been due to the rib at all; in two others it was associated with pain felt vaguely about the shoulder and on the ulnar side of the forearm. On the other hand tenderness in the neck is common, and even light pressure over the projecting rib often causes a marked increase in the limb pains.

The pain in the limb is very characteristic in its distribution. Vaguely felt about the shoulder and upper arm it especially selects the ulnar border of the forearm, extending from above the inner condyle of the humerus to the styloid process of the ulna or into the fingers, and thus following the distribution of the first dorsal or first dorsal and eighth cervical roots. It is obvious that the rib must press mainly upon the lower trunk or inner cord of the plexus which is derived from these two roots, and it is fair to presume that the first dorsal lies lower than the eighth cervical, even after their union, so that the special selection of this root is readily intelligible and is moreover fully demonstrated by the paralytic cases.

In nature the pain is described as tingling, or as numb pain or as being "like the feeling caused by pressing on the funny bone." It is often associated with a marked feeling of coldness and is apt to be aggravated by cold.

The following cases illustrate varying degrees of these

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subjective symptoms as well as the local and arterial symptoms resulting from the supernumerary rib.

CASE I. Neuralgia, weakness, occasional anæsthesia; arterial symptoms. Removal of rib. Cure.

F. A., a married woman, aged 27, was sent to me in March, 1907, by Dr. Hopkinson of Withington. She stated that she had "always" suffered from feeble circulation in the hands, and had "always" noticed that the right side of the neck was a little fuller than the left. For rather less than a year she had noticed a distinct "lump" in the right posterior triangle of the neck. For a few years past she had suffered from occasional loss of sensation in the right hand, chiefly when holding small objects, and this was becoming more frequent and was accompanied by occasional tingling in the fingers "as if she had knocked the funny bone." These troubles were felt principally in the index and middle fingers, slightly in the thumb and ring finger, and not at all in the little finger. Along with these more defined subjective symptoms there was some general aching of the right arm which tired more readily than the left.

On examination both sides of the neck presented distinct hard prominences in the lower part of the posterior triangles which felt like cervical ribs. That upon the right side was distinctly larger and was tender on slight pressure. The subclavian arteries were both clearly felt and appeared to be lying free and in front of the bony prominences, but the right radial pulse was feebler than the left. No objective muscular weakness or wasting and no anæsthesia could be detected. The radiogram (Fig. 5) shows very clearly the right cervical rib, but as usual gives a very imperfect idea of the size of the latter which is so foreshortened as to appear only as a short thick projection.

The marked subjective symptoms on the right side led me to remove that rib. A straight incision in the posterior triangle near the border of the trapezius with slight division of the anterior fibres of the latter readily exposed the projecting bone at its most prominent part. By blunt dissection it was traced back towards the spine, the periosteum being left on the bone, and the soft parts, which are here loosely attached, allowing ready separation without exposure of important structures. The base of the process was then cut across with bone forceps, after which it could be elevated from its bed, being attached anteriorly by fibrous tissue only. Blunt dissection was now carried forwards, the brachial plexus and vessels being readily raised up without being in any way cleaned. The rib was roughly round in contour, and at its base had a diameter of rather less than half an inch, gradually

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Fig. 5. Cervical rib on right side as seen from behind, from case v.

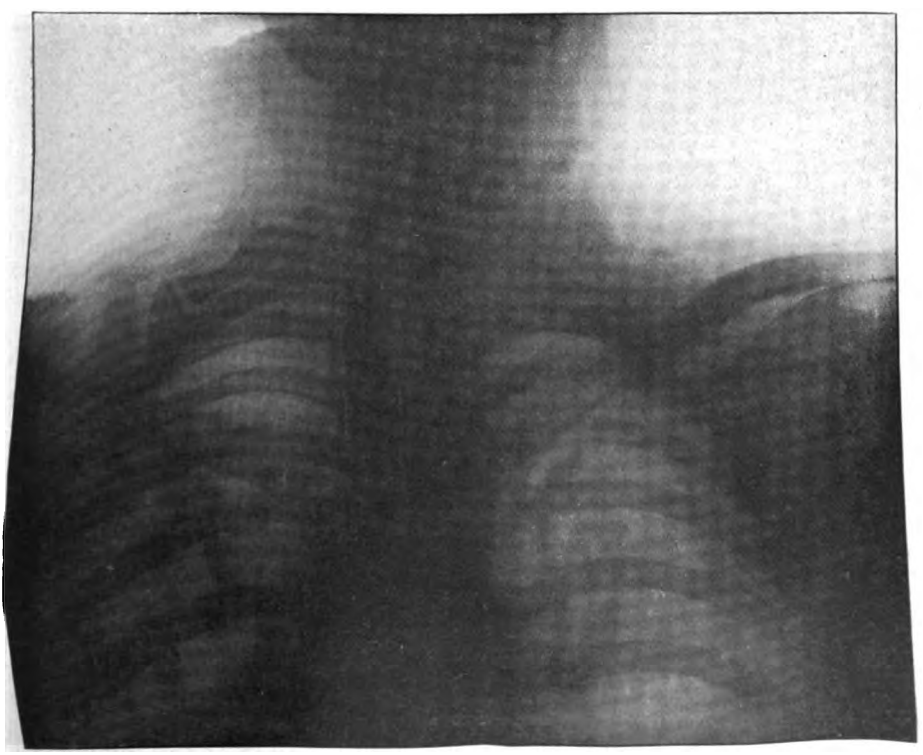

Fig. 6. Radiogram from behind showing cervical rib on left side (case iv.).

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tapering slightly towards an apex, which was very firmly bound down by fibrous tissue to the first rib or sternum or both. Elevation now became very difficult, and as it was continued the high dome of the pleura was torn, air rushing in with a loud hiss. Under these circumstances the tip of the process was cut off and left *in situ* with its strong ligaments, the fragment removed being about two inches long. The wound was then quickly closed.

Some pain was felt in the upper part of the right chest for about two days, but on removal of the dressing no abnormal physical signs were detected nor was there at any time cough or rise of temperature. The wound healed without difficulty and the patient left the nursing home perfectly well on the thirteenth day. The nerve symptoms had disappeared and the radial pulses were of equal strength.

CASE II. Bilateral neuralgia; arterial symptoms. Removal of rib. Cure.

C. M., aged 25, a young lady, sent to me by Dr. Lord of Colwyn Bay, in April, 1907, stated that two years previously she had fallen from a bicycle wrenching her right arm, in which for two months she had sharp pain on movement. This passed away, but returned a few months later after slightly "spraining" the arm by getting into a train. Again it passed off, to return after a fall upon the right elbow, but she continued to have occasional attacks of "rheumatism" in the shoulder especially in the winter of 1906–7. About February, 1907, she had more pain in the right arm and a feeling of weakness "as if she did not want to use it." There was nothing in these symptoms to suggest the presence of a cervical rib, and the general description of intermittent pain spread over a long period was naturally not very precise, but it was clear that the suffering was at times considerable, and this combined with the slight weakness was of serious importance as the patient was by profession a pianist and teacher of music. At this first examination her case was regarded as one of neuritis, probably of traumatic origin, and under ordinary measures there followed considerable improvement for a time.

Four months later in July, 1907, Miss M. again consulted me, and stated that although there had been intermissions the pain and weakness had continued, and that a short time previously as she was putting her arm into the sleeve of a coat she felt a curious "crick" in the left shoulder, since when she had had pain similar to that previously experienced on the right side. She now had pain about both shoulders, not radiating definitely into the arms, the right arm still felt weak, there was some tingling on the backs of both hands and she had noticed a sensation of coldness in the hands, especially on the right side. The symmetry of the symptoms now first suggested

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the presence of cervical ribs or at least some lesion other than traumatic neuritis.

Careful examination failed to show any atrophy, objectively definable weakness or anæsthesia of the limbs. The right radial pulse was much more feeble than the left, both subclavian arteries were prominent and a systolic bruit and thrill were present in both vessels, being well marked on the right side and slight on the left. A careful examination of the neck left the presence of supernumerary ribs quite uncertain, but there was more fulness of the left side and I suspected bilateral bony projections. Skiagrams taken for me by Drs. Bythell and Barclay placed the matter absolutely beyond doubt, both ribs being clearly seen and the left being larger although associated with symptoms of less intensity and later date (Fig. 3).

In view of the probability of increasing paralysis as well as for the relief of pain I operated on the right side on July 29th, 1907. A straight incision some three inches long was made parallel to, and about an inch in front of, the anterior border of the trapezius and carried through the superficial structures. The transverse cervical vein alone required ligature. The upper and posterior part of the offending rib was readily exposed lying high in the neck. It was cut across close to its vertebral origin but showed no mobility and ran down into the chest as an unyielding bar. The tracing of its course downwards and forwards now proved a very difficult matter, but was carried for a distance of nearly three inches by blunt dissection. The bone continued to expand, and it was clearly attached by bone or very dense fascia, so that ultimately it had to be broken away at its anterior end, any further dissection being too dangerous to be practicable. During the operation, Dr. W. P. Stocks noticed that the radial pulse was several times obliterated by traction upon the bone or by dissecting along its outer aspect, but after its removal this pulse became, and has since remained, as strong as that upon the left side. In the final stages we heard the whistling sound of air entering the pleura but this ceased immediately after the bone was removed. Wound healing was as rapid and complete as in most operations upon the neck, but was followed after some two months by the formation under the scar of abscesses, the nature of which was never clearly ascertained.

An attack of aseptic pleurisy in the right chest followed the operation, but cleared up in a few weeks. The pain in the right arm disappeared entirely after operation.

The specimen removed in this case is most complete and very closely resembles an imperfect first dorsal rib (Fig. 2). Sickle-shaped in outline its convex border is three inches long. At its vertebral end it is half an inch wide and a quarter of an inch thick; anteriorly, where it has been broken away, it

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becomes very thin but about an inch wide. Its outer surface, which was inclined slightly downwards, is as sharp as a paper knife. The skiagram naturally gives no indication of the existence of so large a structure because it there appears very foreshortened, while its thin anterior portion would be much buried and would in any case yield but little shadow.

CASE III. Neuralgia. Removal of rib. Imperfect relief of symptoms.

The following case is in many respects a highly unsatisfactory example of the condition, but illustrates the difficulties of diagnosis.

E. O., a stout and somewhat neurotic woman, sent by Dr. Cook of Askam in Furness, began to suffer at the age of 46 from pain which was vaguely described as occupying the region of the right upper limb and breast but which principally involved the inner side of the arm and forearm. The pain was described as tingling and boring but could not be localised with any precision; it was unrelieved by any medicinal treatment. The affected limb presented no trace of paralysis or anæsthesia but was little used as movements increased pain. Just above the centre of the right clavicle was felt, under the brachial plexus, a distinct but deep-seated rounded swelling, any pressure over which was accompanied with great tenderness and increased pain in the limb. The impression given was that of an enlarged and hard lymphatic gland about the size of a hazel nut.

On November 1st, 1906, Mrs. O. was admitted to the Manchester Royal Infirmary and radiograms were taken on three separate occasions but nothing abnormal was revealed. Both subclavian arteries were somewhat prominent and the right radial pulse was very distinctly weaker than the left. A slight blowing systolic murmur was audible over the aortic area and over both subclavian arteries, and it was suspected that there might be some atheroma, although no marked symptoms were present. The swelling above the right clavicle remained unaltered as did the pain.

After three weeks of careful observation, which always failed to discover any symptoms sufficiently typical to establish a certain diagnosis, the brachial plexus and swelling were explored. A long curved incision was carried along the centre of the clavicle, thence over the acromian process and upwards and slightly backwards over the trapezius so as to allow of the reflection upwards of a flap from the lower part of the posterior triangle. The somewhat extended insertion of the trapezius was partially divided and the brachial plexus and subclavian artery exposed by the usual blunt dissection; these structures presented no abnormality and there were no enlarged glands. The swelling which had been felt through the skin was now found

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to be a rounded bony process projecting almost straight forward from the side of the seventh cervical vertebra, and the nerves were cleared away from its blunt, rounded end. The process was quite immovable, as if in bony continuity with the spine, and although firmly connected with the deep muscles of the neck had no anterior connection with the first rib or sternum. Its exposure was far less satisfactory than in the operation which I have usually adopted for the removal of a rib, and the relationships of the scalene muscles were not investigated, but about three-quarters of an inch of the finger-like projection of bone was cut off and finally torn away. Wound healing was uneventful and pain was cured so far as the inner side of the upper limb was concerned, but six months later the patient still complained of pain in the deltoid region only.

In this case there can be no doubt that the cause of symptoms was a small rib pushing forwards upon the brachial plexus, and the absence of any shadow in the skiagram doubtless arose from the fact that it could only be obtained "end on" and lying beneath the transverse process. The diagnosis was, of course, further complicated by the possibility of atheroma and illustrates how readily the condition might be mistaken for an aneurism. It also appears probable that the pressure in this case was not due to the artery and nerves passing over the rib, but to the latter pushing forwards against them and thus continuing after operation to press slightly on the upper plexus.

CASE IV. Slight neuralgia; arterial symptoms.

A woman, fifty-three years of age, who had noticed a lump on the left side of the neck for many years was shown to me by Dr. Charles Melland. Through the somewhat fat tissues is clearly felt a bony prominence occupying the usual position in the left posterior triangle. The radiogram shows the supernumerary rib and its articulation with the tubercle on the first dorsal rib (Fig. 6).

The left subclavian artery is distinctly higher in the neck than that of the right side and presents visible pulsation, the left radial pulse being slightly smaller than the right; a systolic murmur is also audible above the left clavicle only. A vaguely described numbness and tingling is frequently felt in the arms and hands, but is equally present on both sides.

In each of the above cases the most prominent symptom was pain, which was, however, associated in one with weakness of the limb. In the following slight case the only symptoms complained of were the deformity of the neck and ready fatigue of the limb which often precedes more serious results.

CASE V. Case v., sent to me by Dr. Kant, of Romiley, is that of a girl, aged twenty-two, who had noticed a "small hard

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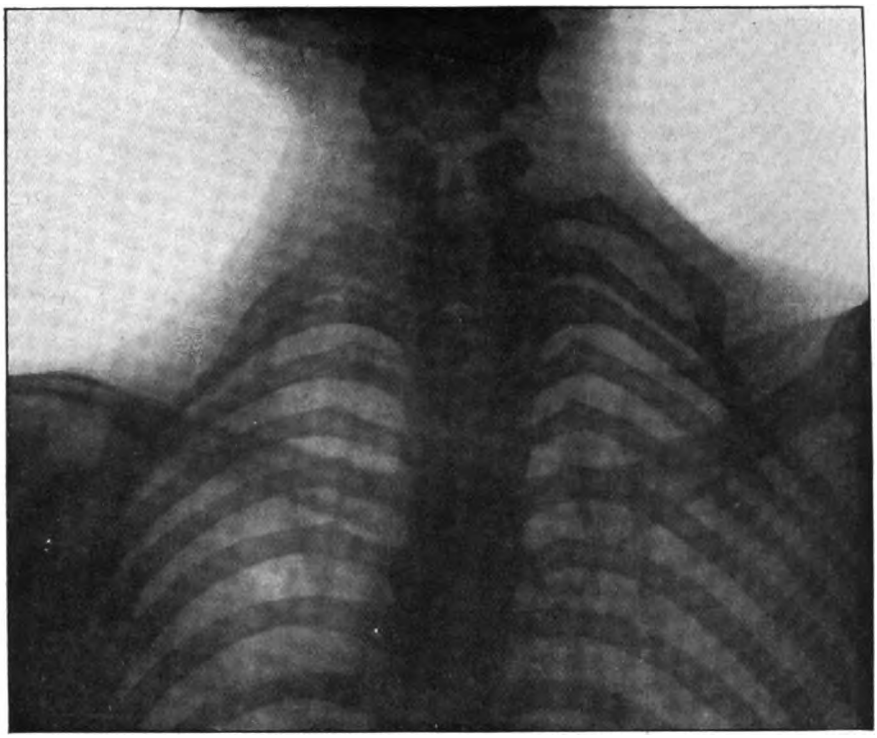

Fig. 7. Radiogram from behind showing cervical rib on right side (case v.).

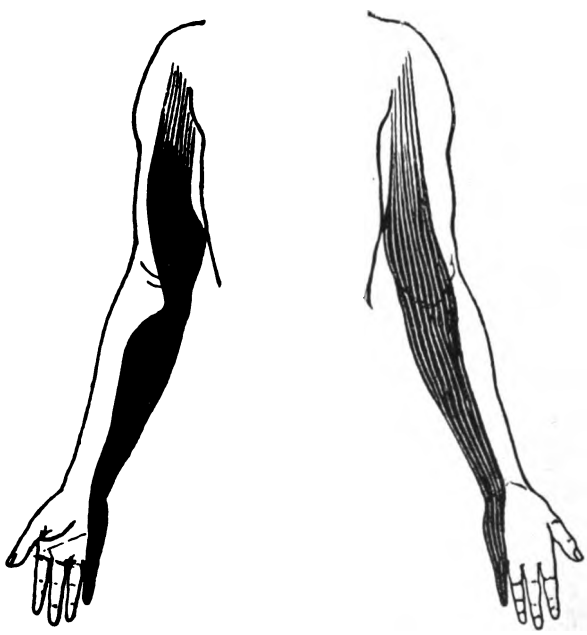

Fig. 8. Painful areas on front and back of upper limb (case vi), from photographs of areas painted by the patient.

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lump" in the right side of the neck for more than a year, the lump having slowly increased in size. The neck presented obvious fulness in the right posterior triangle, and a bony mass could be clearly felt extending from the seventh cervical vertebra downwards, outwards, and then forwards. The rib is very clearly shown in the radiogram (Fig. 7) and appears to unite with the scalene tubercle on the first dorsal rib. The left side of the neck presents no deformity.

There are no pressure symptoms in this case. The subclavian artery is readily felt immediately to the inner end of the bony mass, the brachial and radial pulses being of equal volume on both sides. The only evidence of any affection of the brachial plexus is the statement that the right upper limb becomes tired very quickly.

Paralytic Cases.

We may now turn to the more serious cases in which we find definite objective symptoms, generally confined to irritation or paralysis of the first dorsal, or of the first dorsal and eighth cervical nerve roots. It will be found that these cases generally commence with purely subjective symptoms but that the latter tend gradually to develop into the more severe type.

Case vi. Case vi., sent by Dr. Matthews, of Levenshulme, is that of a lady, twenty-one years of age, who had suffered from pain in the right upper limb from her twelfth year, the pain being much increased about a year before I saw her, when loss of power was also noticed in the right hand.

On each side of the neck was felt a bony prominence with the characters already described, that upon the right being distinctly the larger. These swellings were so inconspicuous as to have previously escaped the observation of the patient. The right radial pulse was distinctly weaker than the left. No radiogram was obtained.

The nervous symptoms were described with great precision by the very intelligent patient. The "grip" of the right hand was much weakened; the thumb could not be properly used, abduction, adduction, and opposition being very weak; abduction of the index finger was very feeble, adduction less markedly so; the lateral movements of the middle finger were weakened to a less extent; the ring and little fingers presented no marked weakness but were very liable to cramp, while the middle finger also became cramped on lifting small objects. Cramp was never noted in the more paralysed thumb and index finger.

Atrophy was well marked in the thenar eminence and over the abductor indicis, while there was hollowing between the index and middle fingers, but no wasting could be detected in

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the intermetacarpal spaces of the ulnar side of the hand or in the hypothenar eminence. The flexor carpi ulnaris appeared to be slightly wasted, and there was a little hollowness in front of the wrist.

The location of pain was described with much accuracy, and the patient painted for me the painful area of which I was then able to take photographs, from which the accompanying diagrams have been prepared (Fig. 8). Except on the inner aspect of the upper arm, which is supplied by the second dorsal nerve, this pain was felt internally to two lines, running from the shoulder to the cleft between the little and ring fingers. Of these lines the anterior started from the tip of the acromion and ran down the centre of the biceps until within a few inches of the elbow; veering inwards it then passed internal to the tendon of the biceps, returned once more almost to the centre of the forearm and again worked gradually inwards, crossing the wrist at the line of the ulnar artery, and extending to the innermost interdigital cleft. The posterior line ran from the angle of the acromion slightly inwards to the olecranon, and thence almost straight down over the lower end of the ulna to meet its fellow in the web between the little and ring fingers.

Sensation was said to be slightly defective in the whole of the painful area and in the hand, but no objective estimation of anæsthesia was possible. The sensory defect appeared to be mainly thermal, and was noted by the patient, especially in washing. The right hand also felt cold subjectively and it presented very slight œdema.

In November of 1898, I removed the right cervical rib, and four and a half years later the patient wrote to me: "I have not felt the pain in my right arm at all since the operation. Sensation and strength in the fingers have returned slowly, and, though I am still very awkward, I am glad to say I can use my fingers much better than I could. A little while ago I could not use my first finger at the first joint, but I can do so now quite readily. With regard to the left side, I sometimes have the same dull aching pain in my arm, and the fingers of my left hand are very weak; also the muscle at the ball of the thumb is almost flat. That muscle on the right side has developed again to a great extent."

Case vii. Case vii. was transferred to my wards by Dr. Dreschfeld. The patient is a girl aged 19, working in a waterproof manufactory, who had been troubled for two years with pain in the right upper limb. When first felt this extended from immediately above the elbow down the inner side of the forearm to the hand, but at a later date it became more diffused. Cramp and weakness of the right hand gradually supervened.

The neck presented no visible swelling, but the cervical ribs could be readily felt upon both sides, the right being the

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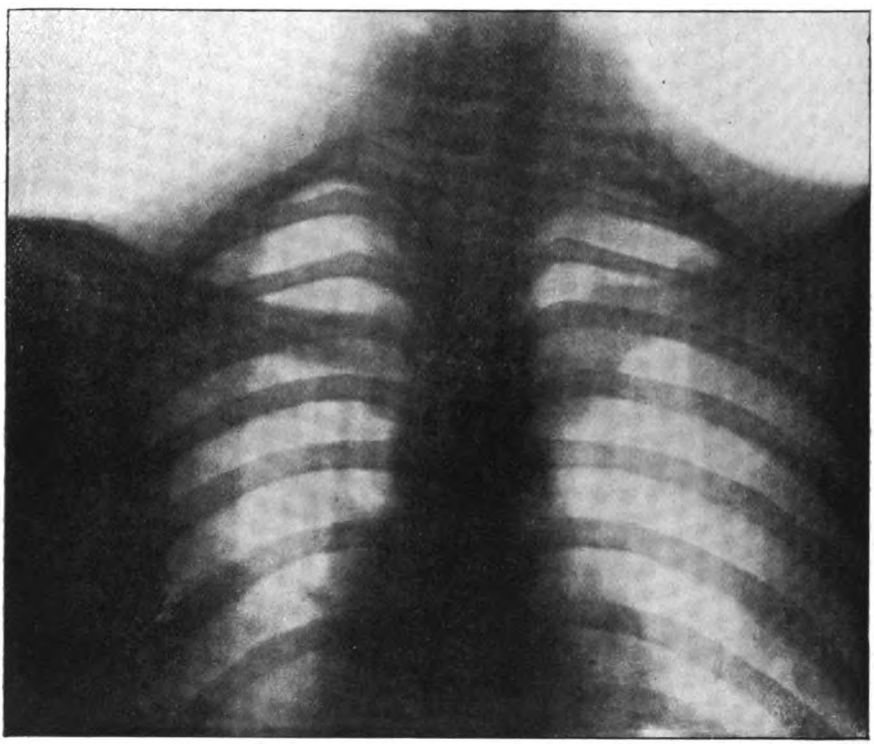

Fig. 9. Radiogram from behind showing cervical rib on right side (case vii.)

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larger. The radiogram, taken, as in other cases, from behind, is by no means clear, but indicates beyond question an excess of bone upon the right side (Fig. 9). The right subclavian artery was prominent, and the right radial pulse distinctly weaker than the left.

The right hand was very weak, the fingers being held close together and in a position of partial flexion, most marked at the interphalangeal joints. Abduction, adduction, and opposition of the thumb were all very weak, and lateral movements of the fingers were almost lost, except that slight abduction remained to the little finger. The position of flexion was more marked in the ring and little fingers than in the index and middle. Cramp was especially marked when the hand became cold, causing increased flexion, which affected principally the ring finger, and to a less extent the little and middle fingers, sparing the thumb and index. Clonic twitching also occasionally attacked the ring finger only. The constant spastic flexion of the inner fingers had given rise to a habit of straightening them out by means of the other hand. Atrophy was very marked in the thenar eminence, abductor indicis and interosseous spaces, but did not involve the hypothenar eminence. The right arm and forearm and the left upper limb presented no motor changes.

Pain and blunting of sensation were well marked, but of ill-defined outline, in an area extending from about an inch or two above the internal condyle of the humerus down the inner side of the forearm to the wrist, and thence onwards to the two inner fingers. At times this region would feel subjectively hot and burning, at other times cold and clammy.

I removed the right cervical rib, which extended well forwards into the neck, and was attached by a synovial joint to the enlarged scalene tubercle of the first dorsal rib. At the end of a year the symptoms of paralysis, spasm, and atrophy had passed away, the hand being very slightly weaker and less developed than its fellow, but slight pain was still said to be felt inside the forearm.

CASE VIII. The following case is very remarkable as showing the advanced age at which cervical ribs may first cause pressure symptoms, while it also illustrates the seriousness which these symptoms may assume and the later stages of the affection.

M. A., a widow, 72 years of age, was sent to me by Dr. Harbinson of Matlock on account of recent paralytic symptoms in the left hand, the true cause of which was strongly suspected by her medical adviser.

She stated that when about 20 years of age she began to have trouble with the right arm. This trouble was regarded as a result of confinement, and in the course of half a century much of the detail had been forgotten, but the patient remembered that for some three years she suffered from great pain in the

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right upper limb, at the end of which time the pain passed away, leaving a condition of paralysis which had undergone no change for at least forty years. During the last fifteen months, *i.e.*, from about the 70th year, symptoms had commenced in the left hand, which had never before given any trouble.

The right hand was in the typical *main en griffe* position with glossy red and very dry skin. All its intrinsic muscles were much wasted, those of her thumb index and middle finger being most markedly so. Adduction and abduction of the fingers were lost as was the power of opposition, while the grip was exceedingly feeble, probably from long disuse. The sense of touch and pain was lost in the distribution of the ulnar nerve on the hand and in the little and ring fingers anteriorly and posteriorly, while partial loss extended outwards to the cleft between the index finger and thumb, and for a short distance on to the ball of the latter. (Figs. 10 and 10a.) The entire hand was of course useless, but was free from pain.

The *left hand* presented hyperextension of the metacarpophalangeal joint and flexion of the interphalangeal joints of the index finger and to a slight extent of the middle finger. Movements of abduction and adduction of the fingers and of opposition were weak, but the grip was better than on the right side, although feeble. The patient noticed that the weakness was greatest in the morning and on cold days, and that at times she was quite unable to hold any article: she had also noticed some deviation of the hand to the ulnar side. Pain was felt on the left side only, and ran down the inner side and back of the upper arm and forearm to the wrist, being located principally along the inner side of the limb in the region of the elbow joint. Sensation of touch and pain were impaired, but not lost, about the inner side of the wrist and hand. This loss extended further outwards in front than on the back of the hand. (Figs. 10 and 10a.) The left hand also gave marked subjective sensation of coldness, and cold objects when applied to its inner side felt very cold, a condition not obtaining in the right hand. As on the right side the whole of the left upper limb was feeble, but without special implication of any muscles.

Local examination of the neck revealed marked prominence of both subclavian arteries, but the left was especially well defined, and on the left side the prominence of a rib was most clearly felt, and was tender on pressure. Both radial pulses were weak, the left being more so than the right. The radiogram in this case was quite typical and showed a distinctly larger rib upon the left side, thus again illustrating the want of relationship between the size of such a rib and the severity or date of onset of nervous symptoms. (Fig. 11.)

The heart presented a well marked mitral systolic murmur and the age and general condition of the patient rendered operative treatment impracticable.

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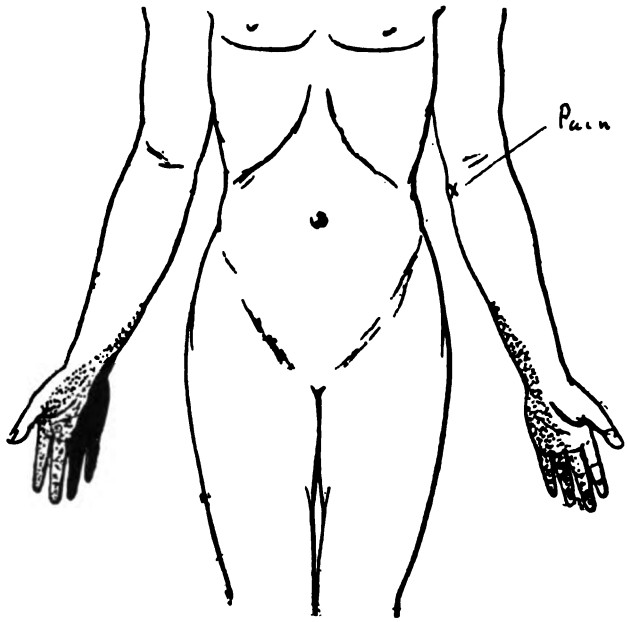

Fig. 10. Sensory disturbances in case viii. Anæsthesia shaded black, partial anæsthesia dotted.

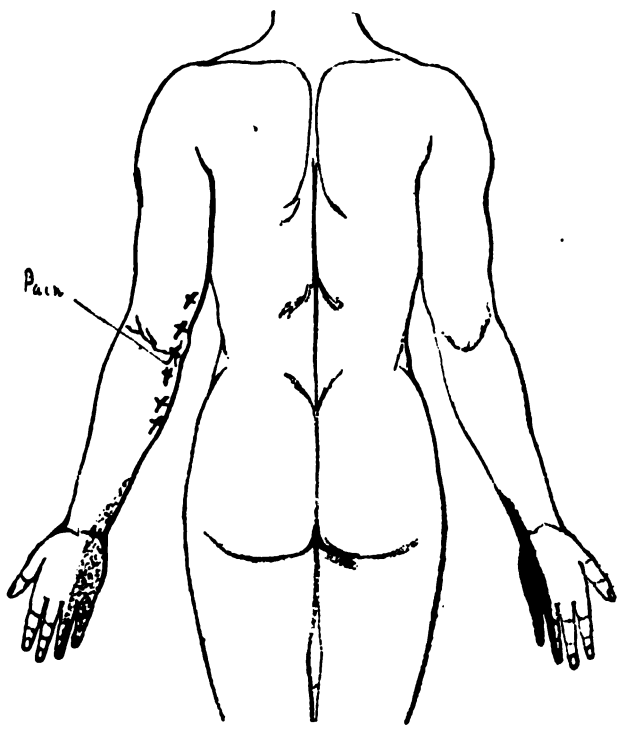

Fig. 10*a*. Sensory disturbances in case viii. See Fig. 10.

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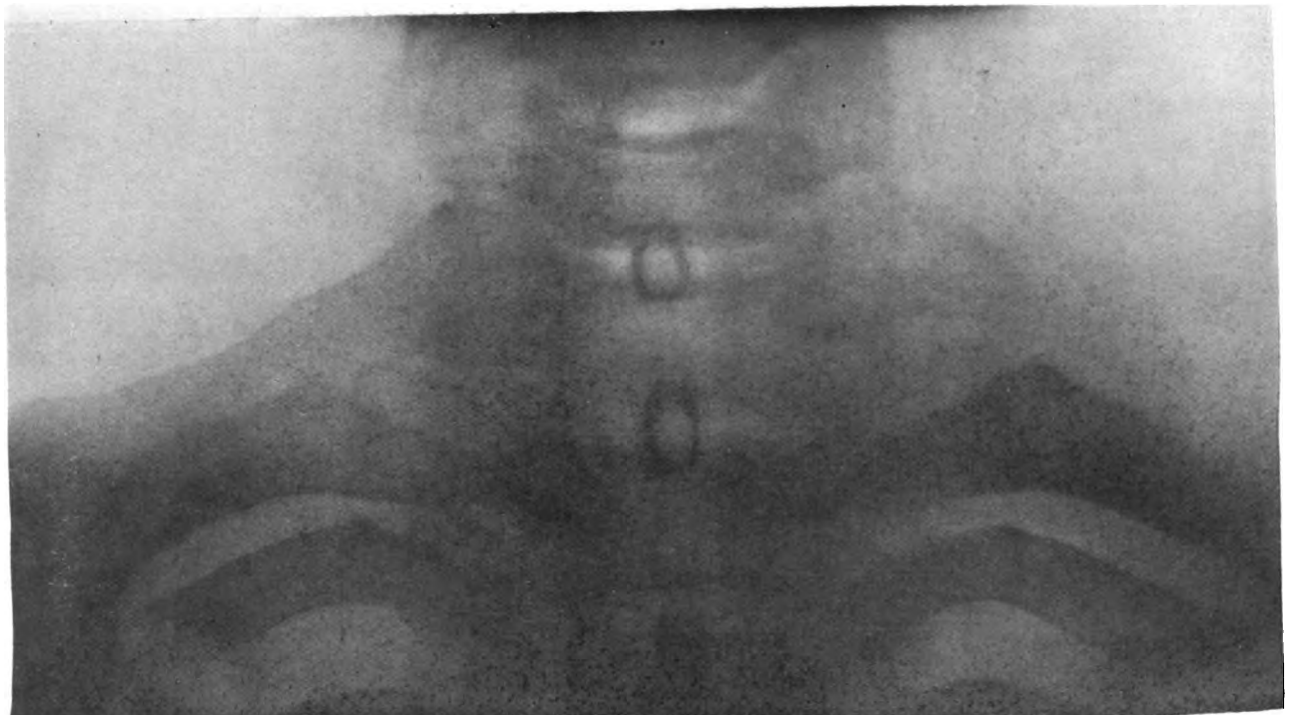

Fig. 11. Double cervical rib seen from behind from case viii. The original radiogram shows clearly on the left side ankylosis of the cervical rib with the first dorsal.

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CASE IX. The following presents typical symptoms and is interesting in its bearing on the causation of these symptoms.

A. T., a woman aged 35, shown to me by Dr. Brockbank, had been subject from childhood to pain in the upper limbs especially on the left side: on the right this was principally on the outer side of the upper arm, on the left it involved the deltoid region and also the inner side of the forearm. For at least the last ten years no change had been noted in this condition until four months before examination, when wasting began in the left hand. On further investigation it appeared that five months ago a child, aged five years, was found to be suffering from tuberculous disease of the ankle, and the mother had acquired the habit of carrying this child on the left arm while doing her work with the right, the wasting coming on about a month later. The wasting was also said to have begun in the ball of the thumb thence spreading rapidly to the rest of the hand, quickly reaching its present height.

The left hand shows well-marked clawing of the first, second and third fingers; the little finger is straight but somewhat abducted: the palm is flat with marked loss of the thenar and hypothenar eminences and obvious wasting of the interossei. The bellies of the flexors of the fingers and of the ulnar flexor of the wrist are also distinctly wasted. All movements of the hand can be effected but are weak and difficult.

On the sensory side there is pain as already described and a sensation of coldness in the hand has been present for about a year. Sensation on the left side is blunted as compared with the right from the internal condyle of the humerus to the styloid process of the ulna, but no exact boundaries can be defined: the distinction of sharp and blunt pressure is defective, and tactile sense is apparently less impaired than pain sense. In the hand no anæsthesia could be discovered.

Both radial pulses were weak, but they presented no marked difference.

In the neck the prominence of the left cervical rib could be easily felt and was distinctly tender even on light pressure, but the subclavian arteries were not notably prominent. A radiogram shows well-defined cervical ribs on both sides, the left being the larger.

These four cases present remarkably similar and quite typical symptoms which are of the "infra-brachial" type of brachial paralysis but have certain special characters, and it will be convenient to summarise these.

CASE VI. Pain on the inner side of the arm and forearm running into the little finger; loss of thermal sense in the painful area: paralysis of the intrinsic muscles of the hand

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with marked atrophy of those on its radial side and cramp on the ulnar side. Some weakness of the flexors of the fingers and wasting of the flexor carpi ulnaris.

CASE VII. Pain and slight anæsthesia with burning sensations from above the internal condyle of the humerus down the inner side of the forearm to the wrist and two inner fingers: paralysis of the muscles of the hand with *main en griffe:* atrophy of the outer muscles of the hand: cramps and twitchings of those on the inner side.

CASE VIII. On the *right* side (old-standing) paralysis and atrophy of the hand muscles; *main en griffe:* anæsthesia of the ulnar side of the hand. On the (recent) *left* side pain running down the inner side and back of the upper arm and forearm to the wrist, most severe about the inner side of the elbow joint: paralysis of the intrinsic muscles of the hand: partial anæsthesia about the ulnar side of the hand and inner fingers.

CASE IX. Pain about the shoulder and inner side of the forearm: atrophy of the hand muscles beginning in the thumb: *main en griffe:* slight anæsthesia from the inner condyle of the humerus to the styloid process of the ulnar. Wasting of the flexors of the fingers and of the flexor carpi ulnaris.

The paralysis is most marked in the muscles of the thumb, in which also it is generally first noticed, and it becomes less prominent as we pass towards the ulnar side of the hand, although it generally involves all the intrinsic muscles of the hand. Spasm on the other hand is more marked on the ulnar side of the hand, and is absent on the radial side. As in other lesions of the brachial plexus atrophy is great and, when contrasted with ordinary lesions of peripheral nerves, out of proportion to the amount of paralysis. Claw hand is of course produced in the more marked cases. In case vi. there is some weakness of the flexors of the fingers and atrophy of the flexor carpi ulnaris: in case vii. these muscles presented some spasm, and in case ix. they were also atrophied.

It is tolerably certain that the pressure upon the brachial plexus impinges upon its inner cord, which is derived from the lower trunk, and again from the eighth cervical and first dorsal roots, and it is also probable that the fibres derived from the first dorsal root lie lowest and in closest proximity to the bone, so that the clinical results will be similar to those of an affection of that root alone, although the eighth cervical may also be involved. The indications that the nerves for the radial side of the hand lie below or behind those for the ulnar side at the point of pressure, and that paralysis and atrophy thus predominate on the outer side of the hand while spasm attacks its inner side, is of considerable interest, and may prove of diagnostic value.

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The sensory symptoms are also characteristic of pressure on the first dorsal and possibly the eighth cervical root. Pain and defects of sensation generally commence some little distance above the internal condyle, *i.e.*, at the lower margin of the distribution of the second dorsal root and they extend downwards to the styloid process of the ulnar or beyond into the fingers. As in other affections of the brachial plexus dissociation of various forms of sensation is noticeable. The thermal sense appears to be most readily affected and pain sense is more readily abolished than is that of touch, but no very complete or well-defined anæsthesia is found in any of the cases.

Whether this group of symptoms is to be regarded as involving solely the distribution of the first dorsal root, or whether the eighth cervical is also involved, will depend upon the ultimate answer to the question of the boundary between these two roots or segments of the spinal cord. My own observations upon spinal injuries led me to regard the first dorsal root as supplying sensory fibres only as far down the limb as the styloid process of the ulna. Head carries the root a little further on to the palm so as to include the hypothenar eminence. Kocher carries it still further on to the little finger or little and ring fingers. Thus in Kocher's scheme the first dorsal is alone involved, whereas in Head's and mine the eighth cervical would also suffer in several of these cases.

Again, my observations led me to assign to the first dorsal root the motor fibres for the intrinsic muscles of the hand only, while later observers also place in that root the nerves for the long flexors of the fingers. In several of these cases the latter are involved, but as we cannot say that the pressure is limited to the first dorsal root no light is thereby thrown upon the segmental limits. It does, however, seem probable that as the rib impinges upon the plexus after the first dorsal and eighth cervical have joined, the latter should suffer to some extent even if it lies higher and further from the bone, and hence we should expect the clinical picture in these cases to concern something more than the first dorsal segment.

Lastly it may be noted that none of these cases present any oculo-pupillary symptoms, the rami communicantes having

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been given off from the first dorsal root above the point of pressure. Two cases are, however, recorded in which symptoms were present, but of these there was in one co-existent syringomyelia (Schönebeck), and Müller's appears to be the only one in which the symptoms could possibly be due to the rib.

Diagnosis.

The diagnosis of the cervical rib or of complications due to its presence is generally sufficiently easy if the condition be borne in mind, but enough has been said in the early part of this paper to show that it is very often overlooked.

The *radiographic diagnosis* is of course the most important, and will usually establish the existence of the rib, regard being had to the fact already mentioned that it is by no means the most obvious bones which most readily evoke symptoms. In some few cases, however, as in our case iii., the radiographer may fail entirely to demonstrate a rib which is certainly present, and even palpable to the surgeon: in such cases the bone is probably projecting markedly forwards and its shadow is thus covered by the transverse process.

The *vascular conditions* already enumerated will prove of the greatest value as aids to diagnosis, differences in the pulse found in conjunction with nervous symptoms, being usually quite characteristic. The distinction between a prominent subclavian artery and an aneurism should not be difficult, and error is not likely to happen except from carelessness.

The diagnosis of the *nervous symptoms* on the other hand has been frequently missed, and it cannot be doubted that the most distinguished neurologists have in the past overlooked this cause of brachial neuralgia and of "symmetrical atrophy of the hands" or "radicular paralysis." The bilateral cases especially are readily mistaken for such affections as syringomyelia, progressive muscular atrophy or tumours and other pressure lesions of the spinal cord. The presence of sensory changes should at once eliminate anterior poliomyelitis in any form and the absence of oculo-pupillary symptoms or of any evidence of affection of the descending fibres of the spinal cord (exaggeration of reflexes, &c.) should suffice to exclude an

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affection of the spinal cord or its coverings. Uni-radicular paralysis due to other causes can hardly, if at all, be distinguished without radiographic examination, and thus we find that in Lewis Jones' cases the great majority at least proved to be due to cervical ribs, while the cases described by Farquhar Buzzard (Brain, 1902, p. 299) and Edwin Bramwell not having been examined radiographically may possibly have been due to the same cause: they are at least so similar that in a previous communication I have ventured to quote them as probably illustrative of the condition under consideration. We may also say with safety that uniradicular paralyses due to causes other than cervical ribs are very rare and that their true pathology is unknown.

Treatment.

The treatment will depend upon the severity of the symptoms. In some few cases the rib may constitute a distinct deformity and removal may be desired for that reason alone, but it must be rare indeed for the deformity to be such as to render it worth removing at the expense of a scar. It must also rarely be necessary to operate on account of vascular troubles, although marked interference with the circulation and especially threatened or existing gangrene of the fingers will, as in Keen's case, call urgently for removal of the rib.

It is thus generally in connection with nervous symptoms that treatment will be sought either for neuralgic or paralytic symptoms. In the case of distinct paralysis there can seldom be a doubt as to the advisability of operating. Cases vi. and vii. illustrate sufficiently the benefits of such operation. Case viii. illustrates the disastrous result of not operating, the affected limb having remained useless for half a century. Operation will then be called for in all paralytic cases unless, as in Case viii., extreme age or the co-existence of other disease renders any surgical proceeding inadvisable.

In the neuralgic cases it is probable that relief may be given by resting the limb, avoidance of upward and backward movements of the shoulder, and ordinary methods of treatment of neuralgia. When these fail the question of operation will again arise and will be governed largely by the severity of the

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symptoms. It must also be remembered that paralysis may supervene upon neuralgia very rapidly in later life, and it will therefore probably be wise to operate upon all cases of reasonable severity at an early date, and not to await the possibility of more serious nervous changes.

The operative treatment consists in removing the rib or at least so much of it as presses upon the brachial plexus and the subclavian artery. For this purpose various incisions have been used, but the majority of surgeons will probably prefer a straight and more or less vertical cut in the posterior triangle of the neck, a horizontal cut at its lower end being perhaps necessary in a very short thick neck. In Case iii. the uncertainty of diagnosis led me to adopt a curved incision turning up a flap from over the outer side of the clavicle, but this was found to be very inconvenient as not allowing dissection to the upper part of the triangle. The straight incision on the other hand gives a good exposure of the rib, but it must be commenced high in the neck as the seventh cervical vertebra lies far above the clavicle. The exact position of the incision has doubtless varied a good deal, and most surgeons appear to have made it well forward, the result being that the rib has been exposed between the artery and the nerves and the latter have been turned back. In all my cases I have made the incision further back and turned the nerves forward—operating from the side rather than from the front of the neck. The platysma is divided in line with the skin incision and it may be necessary to tie numerous small vessels, although with the more posterior incision I have had singularly little trouble with bleeding. The bone may now be sought by blunt dissection and is not always easily found as it lies deeply in the scalene muscles, and again its position in the neck may be mistaken so that it is looked for too low down. When found it is cleared by blunt dissection, but its periosteum must be removed with it as, in a case of subperiosteal resection, new bone formed after the operation, which had to be repeated. The brachial plexus must of course be carefully raised and carefully handled, as must the subclavian artery; the subclavian vein I have not seen in any case. The suprascapular nerve is somewhat in the way if the incision be posterior to the plexus, and

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it must be carefully guarded. The bone being now exposed at least in part it may be cut away near to the spine and then drawn forwards. If attached in front by ligaments only it comes up into the wound very readily and can be excised with scissors, but if its anterior attachments be bony its total removal becomes very difficult on account of its relation to the pleura. In such cases it may be cut away anteriorly with gouge forceps although the surgeon will feel more comfortable after its total ablation. In any event the radial pulse should be watched and enough of the anterior part of the rib should be removed to make it certain that all pressure is removed from the artery. The method of wound-closure will depend upon the proclivities of the surgeon; personally I have not employed any drainage.

There are apparently no cases on record in which the operation proved fatal but certain definite dangers have to be encountered. In several cases there has followed paralysis of the whole or part of the brachial plexus as a result of stretching, and this has not always been transient. Reference has also been made to consecutive aneurism of the subclavian artery. If the posterior incision be used it would seem very improbable that either the vessel of the nerves should be injured, as they can be displaced forwards with extreme ease and with no trace of tension. On the other hand the pleura is perhaps more readily torn if the rib be approached from further back and in two cases I have opened its cavity; in one no trouble whatever resulted; in the other, in which we thought that only the most minute trace of air had entered, there ensued a rather severe attack of pleurisy from which, however, the patient eventually made a good recovery. In the last case the utmost care was taken and the specimen (Fig. 2) shows how it would be almost impossible to excise such a bone from its posterior end without tearing a pleural sac spread over its posterior and under surface.

In view of these personal experiences I should be inclined to continue using a posterior incision, displacing the plexus forwards, but not in future to attempt to follow to its anterior end a rib with osseous connections, merely cutting out a bridge with bone forceps and then nibbling away the anterior portion with gouge forceps. This is the more easily done as the ribs which are united by bone to the sternum or the first dorsal rib are apparently very thin in front.

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MALIGNANT DISEASE OF THE BODY OF THE UTERUS.

By ARCHIBALD DONALD, M.A., M.D., C.M.

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The various forms of cancer of the body of the uterus and the symptoms which they produce are not very clearly described in gynæcological text books, and considerable confusion appears still to exist. For this reason I have thought it advisable to collect the cases which have come under my own observation in order that I may try to deduce some general conclusions (1) as to the symptoms, (2) as to the pathology, (3) as to the result of operative treatment, and (4) as to the differential diagnosis.

At the outset I have met with a disappointment which is not uncommon in researches of this kind, as I find that much material which might have been of value has been rendered worthless from the inadequacy or absence of notes which I thought had been preserved, or from loss of specimens which I believed were in safe keeping. But although my cases are thus much reduced in number, I think there are still sufficient remaining to justify this record, especially as the cases represent fairly well the various types of the disease.

In the first place I shall give a few notes of each case, and will then present the main points of interest in tabular form.

CASE 1. *Sarcoma of the endometrium. History.* Mrs. G., Manchester, aged 55; one confinement twenty-five years ago; menopause at fifty; four years amenorrhœa and then uterine hæmorrhage for the last twelve months. The hæmorrhage was at first moderate in amount, with irregular intervals, but gradually increased in quantity and frequency, and has been continuous for the last six weeks. It is of a deep red colour and not offensive. There has been no pain. The patient showed marked anæmia, but there had been no loss of flesh.

On June 12th, 1895, the patient was curetted, and a large quantity of soft friable tissue came away from the uterine cavity. It was then decided to remove the uterus, and vaginal hysterectomy was performed. The patient made a good recovery, and at the present date (1908) is in excellent health.

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Pathology. The uterus was slightly bigger than normal. The cavity was enlarged, and contained a considerable amount of soft tissue similar to that which had been brought away by the curette. The greater portion of the endometrium had the same characters, and there was a fair line of demarcation to be seen by the naked eye between this and the muscular tissue. Dr. Fothergill kindly made a section of the tissue for me, and has described its microscopic characters in a paper which he published in "The Scottish Medical and Surgical Journal" for February, 1898. He says that "the tissue . . . . proved to be a round celled sarcoma. The sections contain very numerous small round cells, but there are also in parts many very large round and oval cells. These sections strongly resemble sections of decidua so far as the component cells are concerned, though they contain none of the uterine glands and well-formed blood vessels which are seen in uterine mucosa during pregnancy. . . . . Here, then, we have a case like those mentioned by Kanthack, Eden, and others, in which large cells closely resembling decidual cells, occur in sarcomata in no way connected with pregnancy."

CASE 2. *Sarcoma of the body of the uterus. History.* Mrs. L., Southport, aged 50; three children, the youngest being sixteen; no definite climacteric; had irregular menstruation with intervals of two and three months about two years ago. Eighteen months ago she began to have attacks of menorrhagia. These have become much more severe and prolonged, and latterly there has been a constant discharge, sometimes sanguineous and sometimes watery and often offensive. There has been pain in the abdomen and back for some months and latterly it has been paroxysmal and acute.

On examination, a hard tumour was felt in the abdomen reaching nearly to the level of the umbilicus. On vaginal examination the external os uteri was found to be dilated to the size of a five-shilling piece. Its margins were tensely stretched by a tumour which presented. There was free hæmorrhage on examination.

On April 5th, 1899, an effort was made to remove the tumour, which was then thought to be a fibroid, through the os uteri, but it broke down so rapidly that this was found to be impossible, and as the hæmorrhage was most profuse, vaginal hysterectomy was decided on. The uterus and tumour were removed *morcellement* as rapidly as possible, the broad ligaments being clamped with forceps as they came into sight. The patient made a good recovery, and for some months afterwards her condition was quite satisfactory. About a year after the operation, however, she began to have severe abdominal and pelvic pain, and on examination it was found that there was a

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hard mass in the lower part of the abdomen on the left side. This increased steadily, and she died in October, 1900.

Pathology. As the uterus was broken up on removal it was impossible to get a clear idea of its exact size and shape. Under the microscope it was found to be composed in parts of fibrous tissue but large portions were made up of large round cells and spindle cells.

CASE 3. *Glandular carcinoma.* Mrs. D., aged 67, was sent to see me in February, 1902, by Dr. Heywood of Irlams-o'-th'-Height. She had passed the climacteric more than twenty years ago, and for the last six months had been suffering from uterine hæmorrhage which became more and more profuse. The hæmorrhage was quite inoffensive; there was no pain, and although the patient was anæmic, there was no cachexia and no wasting. On vaginal examination the vagina and cervix showed the usual senile change, but hæmorrhage was seen coming from the external os. The patient was admitted to a nursing home, and a preliminary curetting on Feb. 28th, 1902, brought away a fairly large quantity of glandular friable tissue. Vaginal hysterectomy was then performed. The patient made a good recovery, and was last heard of about two years after the operation as being in good health. Since then I have been unable to trace her.

Pathology. The uterus was not much enlarged, but the cavity was dilated, and contained a friable growth which was diffused and seemed to dip into muscular tissue at one portion of the posterior wall. On microscopic examination the growth proved to be a glandular carcinoma.

CASE 4. *Glandular carcinoma.* Mrs. G., aged 52, was admitted to St. Mary's Hospital in March, 1904. She was married, but had no children. The notes of her case are somewhat vague, the only symptom noted as of importance is that there had been uterine hæmorrhage for about a year. The uterus was considerably enlarged and was removed by abdominal hysterectomy on March 23rd. She made a good recovery, but recurrence seems to have been rapid, and she died on Sept. 18th of the same year, or about six months after the operation.

Pathology. The naked eye specimen shows the uterus to be irregularly lobulated and enlarged to more than twice the normal size. There is a friable growth which is attached to the surface of the uterine cavity throughout, with the exception of the lower fourth. Under the microscope, the growth was shown to be an adeno-carcinoma. There were masses of epithelial cells which penetrated irregularly into the muscular wall. On the surface there were branching processes covered with epithelium, derived from the glands.

CASE 5. *Glandular carcinoma.* Mrs. J., aged 54, was admitted to St. Mary's Hospital on April 9th, 1904. She had one

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Fig. 1, Case 5.—This photograph shows the presence of enormous masses of tumour growths in the wall of the uterus and the almost complete disappearance of the muscular tissue, which has been reduced to a meshwork amongst these masses.

Fig. 2, Case 8.—Adeno-carcinoma of villous type. Diffuse growth.

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child thirteen years ago. There is no note as to whether there had been any definite menopause, but it is stated that she suffered from irregular hæmorrhage for seven years, that there had been almost constant hæmorrhage for five years, and that there was at times an offensive watery discharge. There was no pain except when large clots were passed. The uterus was removed by a vaginal hysterectomy on the 9th of April, and the patient died within forty-eight hours, apparently from exhaustion.

Pathology. The uterus is enlarged to three times the normal size and is fairly regular in outline; the walls are occupied by a diffuse growth, and the uterine tissue throughout is of a stony hardness. Under the microscope, the appearances were those of glandular carcinoma; on the surface there was excessive gland formation, while in the deeper layers there were numerous spaces packed with epithelial cells. The cancer cells in some areas had almost entirely replaced the muscular tissue (fig. 1).

CASE 6. *Glandular carcinoma.* Mrs. M., aged 51, was admitted to St. Mary's Hospital on Jan. 15th, 1905. She had one confinement twenty years ago. There is no note as to the occurrence of the climacteric. There had been a blood-stained discharge more or less continuous for nine months, and for four months this had been offensive. The patient had complained of more or less constant pain in the hypogastrium for nine months. The uterus was removed by vaginal hysterectomy on the 17th Jan., and the patient made a good recovery. She died on the 19th August, 1906, or more than eighteen months after the operation. There are no particulars as to the cause of death.

Pathology. The uterus is only slightly larger than normal. The walls are not much thickened but there is a friable growth, which dips deeply into muscular tissue and is so diffused that it involves practically the whole of the endometrium. Under the microscope, an advanced stage of adeno-carcinoma was found. Here and there gland structure was found, but there were numerous masses of epithelial cells, frequently wedge-shaped which penetrated into normal tissues.

CASE 7. *Glandular carcinoma.* Miss R., aged 49, was sent to me in November, 1904, by Dr. Nelson of Glossop, on account of continuous uterine hæmorrhage. The periods had been regular until she was about forty-seven, then there had been a year during which were intervals of three or four months between the periods; after this there was regular hæmorrhage every month until about six months before I saw her, when the hæmorrhage began to increase, both in amount and in duration. On bi-manual examination the uterus seemed fairly normal; curetting was performed, and the scrapings examined,

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but the result was not decisive, as the section merely showed increased glandular tissue. The patient was better for a month or so, and then the hæmorrhage returned and gradually became as bad as before. The patient was readmitted to a nursing home in April, 1905, and the uterus was removed by vaginal hysterectomy. Convalescence was smooth, and the patient is still in good health.

Pathology. The uterus is practically normal in size. The whole of the lining membrane is covered with a diffuse growth with the exception of the lower fourth of the uterine cavity, which is free. On microscopic examinaion, there was found excessive and irregular glandular formation with hardly any intervening tissue. The glands are small but many of them are lined with two or more layers of cells which are larger than normal. The growth was an adeno-carcinoma in a fairly early stage.

CASE 8. *Glandular carcinoma.* Mrs. P., aged 51, was admitted to St. Mary's Hospital on Sept. 25th, 1905. She had nine children, and the last confinement was thirteen years ago. She complained of continuous uterine hæmorrhage from February to September, and the discharge had recently become offensive. For four years previous to the onset of this hæmorrhage, the periods had been absent. During the last two months she had suffered from occasional pain in the hypogastrium. The uterus was removed by vaginal hysterectomy on Sept. 27th, and the patient made a good recovery. A letter was received in September last to say she was still in good health.

Pathology. The uterus is slightly larger than normal; in sections a curious tufted growth was seen to be diffused over nearly the whole of the surface of the cavity (see fig. 2). On microscopic examination this is found to consist of branching papillary structures which are lined with epithelium which is somewhat irregular. Nearer the muscle there are solid masses of epithelial cells. The case was one of adeno-carcinoma, fairly advanced (see fig. 3).

CASE 9. *Glandular carcinoma.* Mrs. M., Bolton, came to see me early in 1906 on account of uterine hæmorrhage. She was aged sixty-three, and had been a widow for about seven years. The menopause began about 14 years ago. She had six children, the youngest of whom was twenty-one. The hæmorrhage was of recent occurrence, was not great in amount, but occurred at frequent intervals. There were absolutely no other symptoms. I saw her at intervals during the summer, and as the hæmorrhage was gradually increasing, I advised curetting for diagnostic purposes. The microscopic section of the scrapings showed adenoma of a suspicious character. The curetting had no effect on the hæmorrhage, and hysterectomy

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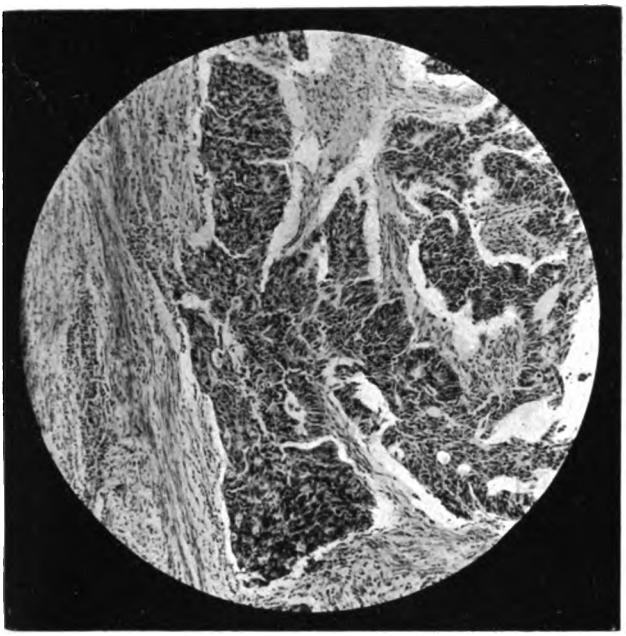

Fig. 3, Case 8.—At the right side of the photograph are situated the surface formations of this tumour, which show the structure of a columnar-celled carcinoma arranged in form of glandular acini. Deeper than this the tumour has the structure of solid masses of cells in which there remains hardly any trace of the glandular structure. These masses are situated close to the muscular layer.

Fig. 4, Case 9.—Adeno-carcinoma of colloid type. Localised growth.

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was performed on Nov. 11th, 1906. The patient made a good recovery, and is now in excellent health.

Pathology. The uterus is not much enlarged, but the cavity contained a polypoid growth about the size of a small walnut, which was attached by a broad base to the fundus and posterior wall (see fig. 4). This growth was very friable in the fresh state. Under the microscope it showed numerous irregular spaces lined with epithelium. The whole section of any part of the tumour showed the same change. In the lumen of many of the acini there was a collection of cellular debris in various stages of colloid change

CASE 10. *Glandular carcinoma with change into squamous epithelioma.* Mrs. H., married, aged 66 years, was admitted to St. Mary's Hospital on May 17th, 1907. She had one child thirty-eight years ago. Her menopause appeared twenty-seven years ago when she was thirty-nine, and for sixteen years there was no menstruation. Eleven years ago hæmorrhage began, and has continued at irregular intervals to the present time; the intervals have never been longer than two months, and at times have been only two weeks. Since the beginning of the year the hæmorrhage has been profuse, and in the intervals there has been a thin, watery discharge which is not offensive. The patient was very anæmic but had not lost flesh. Vaginal hysterectomy was performed on May 18th, 1907, and the patient made a good recovery.

Pathology. The uterus is regular in outline and nearly twice the size of a normal uterus. The cavity contains an irregular friable growth which is attached over about three-fourths of the uterine cavity. This growth is found to dip into the uterine tissues in an irregular way. Under the microscope cylinders of cells closely packed are found to dip in amongst the normal tissues. As the origin of these cells was somewhat doubtful, the specimen was referred to Professor Lorrain Smith, who reports as follows: The surface growth is undoubtedly adeno-carcinoma, but in the muscular wall where the tumour has invaded, the cells are becoming very like squamous epithelial cells,—a transformation that has been described by others."

CASE 11. *Glandular carcinoma.* Mrs. R., widow, 67 years of age, was admitted to St. Mary's Hospital on Oct. 7th 1907. She had two children, the last confinement being twenty-two years ago; the menopause came on sixteen years ago; twelve months ago she began to have a slight hæmorrhagic discharge, and this occurred at intervals of about a week until her admission. The hæmorrhage was never very profuse, but is gradually increasing in amount and is rather offensive; there is no particular pain. Vaginal hysterectomy was performed on Oct. 9th, and the patient made a good recovery.

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Pathology. The uterus is enlarged (half as much again as the normal uterus) and is hard, nodular, and friable. An irregular growth fills the cavity, and seems to spring from a broad surface on the posterior wall of the uterus. Under the microscope the appearances were typical of adeno-carcinoma. There was much infiltration of the deeper tissues with epithelial cells.

Comparative frequency of cancer of the body and cancer of the cervix of the uterus. Cancer of the body is generally estimated as forming about 6 % of all cases of uterine cancer, and some observers put the ratio as even higher. A rough estimate of my own cases shows that this ratio is too high as far as my experience goes. I find that I have performed hysterectomy for cancer of the cervix just about one hundred times. If I allow for cases of cancer of the body which I have omitted from my list, owing to the records being incomplete, and if I exclude cases of sarcoma of the uterus, I find I have operated about fourteen times for cancer of the body. It must be remembered, however, that all, or nearly all the cases of cancer of the body are operated on; the disease is slowly progressive, and even at a late stage, when the nature of the trouble can no longer be overlooked, hysterectomy can usually be performed. On the other hand, the cases of cancer of the cervix in which operation is justifiable, form only a small proportion of the total cases. I have not investigated carefully all my out-patient and private records in order to find the exact number of cases of cancer of the cervix that have come under my observation, but I have sufficient data to enable me to state that I have seen about five hundred cases. Therefore as far as my own experience goes, cancer of the body forms only about 4 % of all cases of uterine cancer.

Age and social condition. The youngest of my patients was forty-nine, while the two eldest were both sixty-seven; four patients were between fifty and sixty, and four were over sixty It is sometimes stated that cancer of the body of the uterus is most common in elderly spinsters or in women who have had no children, but the cases that have come under my observation do not corroborate this statement. Of the patients with uterine cancer only one was unmarried; five were married, and three were widows. Of the eight patients who were, or had been, married, only one was nulliparous.

Pathology. In two cases the disease was sarcoma. In one

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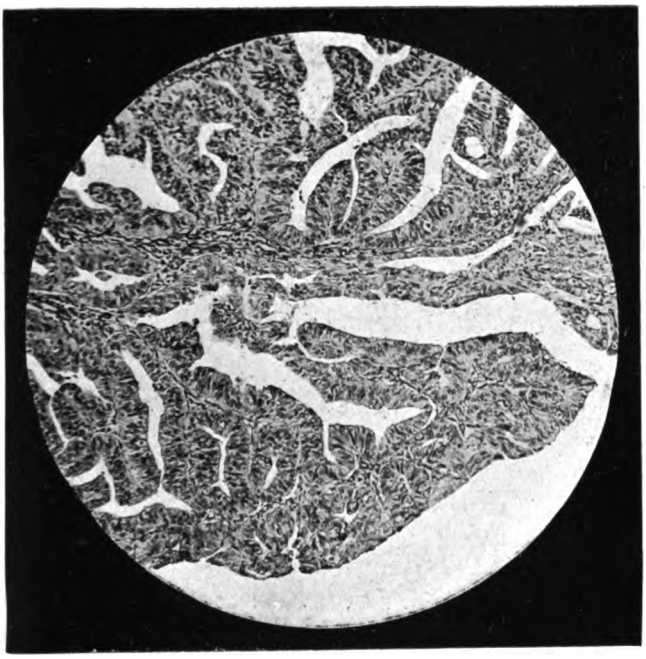

Fig. 5, Case 10A.—This photograph shows the surface layer of the tumour in the form of a typical cylindrical-celled carcinoma.

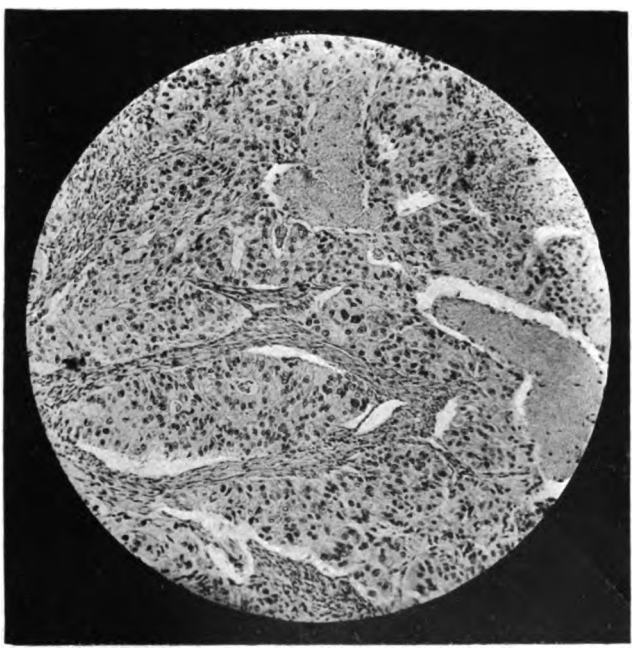

Fig. 6, Case 10B.—This photograph shows the masses of tumour growth in the muscular wall. The cells are columnar in form, but there is little of the gland-like arrangement. They are in solid masses. In the midst of some of the larger masses are seen areas of necrosed cells, etc., represented by glandular débris.

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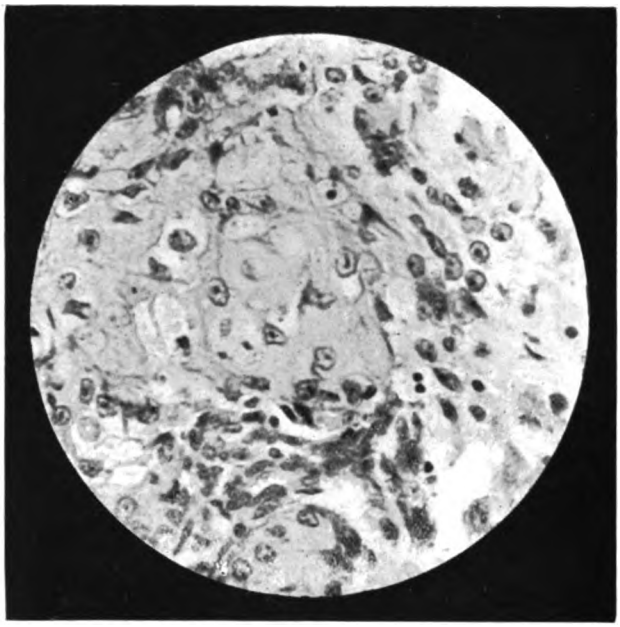

Fig. 7, Case 10C.—This photograph with the D lens shows the transformation of the tall columnar cells into rounded hyaline cells similar to those met with in squamous epithelioma. The nucleus is centrally placed in these cells and is gradually disappearing with the progress of the hyaline change.

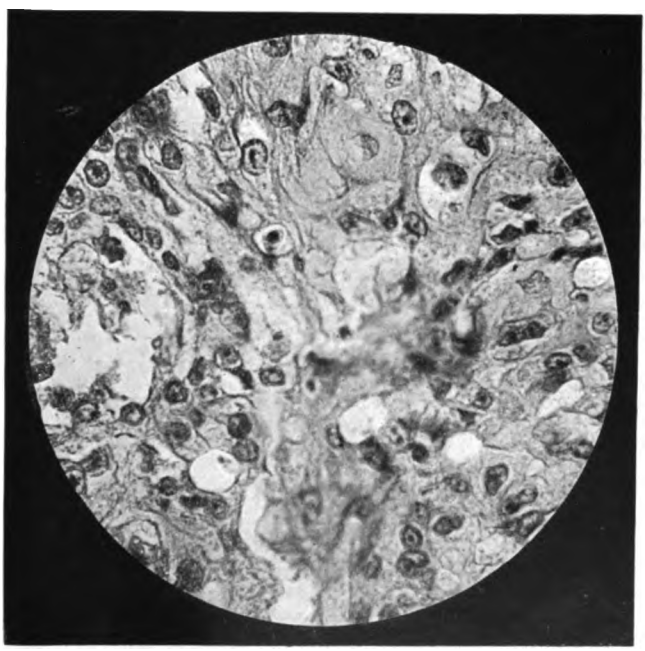

Fig. 8, Case 10D.—This photograph shows the cancer cells undergoing hyaline transformation as they appear under the 1/12 oil immersion lens.

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of these (No. 1) there was a round celled sarcoma with cells resembling decidual cells limited almost entirely to the endometrium; in the other (case 2) there was a large tumour which showed fibroid structure invaded by small round cells. Whether this was an instance of the change from fibroid to sarcomatous growth, which appears to have been proved to occur, or whether it was merely an invasion of a fibroid tumour by a sarcoma originating elsewhere is doubtful.

The other cases were adeno-carcinoma in various stages. I have not attempted to draw a line between malignant adenoma and glandular cancer of the uterus. It seems to me important to avoid a multiplication of terms except when it is absolutely necessary for clearness. There seems to be no doubt that the difference between malignant adenoma and adeno-carcinoma is merely one of degree; most of my specimens show the transition very well (see figs. 3, 5 and 6). On the surface towards the uterine cavity the glandular structures are clearly marked. In some, it is true, the spaces are large and the epithelial lining is thrown into folds or exists in branching papillary processes, but in others the glands are small and are merely shown to be greatly multiplied and so numerous in parts that there is hardly any intervening tissue. In the deeper parts of the endometrium, close to the muscular tissue, one can generally find masses of epithelial cells which show little or no trace of glandular structure; the more advanced the disease, the more numerous are these collections of cells, and the deeper they are found in the uterine tissues.

In all of the cases of glandular cancer, a distinct growth was found in the uterine cavity; this was in most a diffuse growth from nearly the whole endometrium—generally there was an area which was unaffected (fig. 1); in other cases, the growth formed a more or less rounded tumour which sprung from a broad base (fig. 2).

I have not thought it advisable to record any cases of chorion-epithelioma in this paper, as this is a type of malignant disease which differs entirely in mode of origin, history, and prognosis from the usual types.

Symptoms. The only constant symptom of cancer of the body of the uterus is uterine hæmorrhage. It is noted in every one of my cases, and in all of them, with one exception, there is a note to the effect that it was profuse, or continuous, or frequent. In case 4 the notes are very insufficient; they merely

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state that hæmorrhage was present for a year in small amount In nearly all the cases this hæmorrhage occurred after a more or less definite menopause; in two cases there are no notes upon this point, and in other two it is definitely noted that the menopause had not come on. One of these (No. 2) was a case of sarcoma and fibroid, and the other (case 5) was in a patient of fifty-four who had irregular hæmorrhage for seven years. The occurrence, therefore, of hæmorrhage in the post-climacteric period is most suspicious. Intermenstrual discharge was noted in only four cases, and in only five cases of the eleven was there any offensive odour associated with the hæmorrhage or discharge. Pain was present in four cases, but in one of these it was only occasional, and in the other it is noted as only present when clots were passed. There was no definite wasting or loss of flesh in the large majority of cases; in only two was this noted as a symptom.

The average duration of the hæmorrhage, which we may take generally as the starting point of the symptoms, was from a year to eighteen months, but two of the patients had hæmorrhage for a much longer period. In case 5, hæmorrhage had been going on for seven years, and had been almost continuous for five years, while in case 10, the patient had suffered from irregular hæmorrhage for eleven years after sixteen years amenorrhœa. It is hardly possible that these patients can have been suffering from malignant growth during the whole of these long periods. In case 5, the menopause had not been passed, and probably there had been some chronic metritic change before the malignant growth began. In case 10, it is difficult to account for the long duration of the hæmorrhage coming after a well-established menopause, as the uterus showed nothing but glandular cancer.

It may be definitely stated from a study of the cases here reported that adeno-carcinoma of the uterus is a disease which advances slowly. In every case there was an interval of at least a year from the onset of suspicious symptoms to the date of operation, and then the disease in most of the cases was found localised in the mucous membrane and tissues immediately underneath; in only a few cases was the uterus penetrated to any great depth. It is possible that the pelvic glands may become involved at a fairly early period, but the results of operation do not indicate that this is a frequent occurrence.

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Differential diagnosis. In cases of sarcoma of the body of the uterus the difficulty is generally to exclude fibroid tumour. We have to rely chiefly on the comparatively rapid development of symptoms associated with only moderate enlargement of the uterus. Occasionally there is an offensive discharge, and sometimes pain is a prominent feature, but neither of these symptoms is invariable, and both of them may be associated with fibroid tumour. If the uterus contains a fibroid as well as sarcoma, the diagnosis is very difficult and can never be quite definite. Our suspicions are aroused if there is a change in the character of the discharge, or if the general health of the patient shows rapid deterioration. In most cases of sarcoma of the body of the uterus, whether associated with fibroid or not, dilatation of the cervix followed by curetting is necessary to establish the diagnosis; sometimes the diagnosis is made only after removal of the uterus.

The differential diagnosis of cancer of the body generally presents no great difficulty; in the great majority of cases it is a post-climacteric disease. Hæmorrhage after the menopause should always excite our suspicions, and no elderly woman who suffers from uterine bleeding should be allowed to go unexamined. There are exceptional cases in which this bleeding may be caused by non-malignant affection. It may be due to (1) mechanical causes, (2) to mucous polypi, (3) to fibroid tumour, (4) to non-malignant endometritis.

Hæmorrhage may be caused by mechanical causes in elderly women when there is well marked prolapse, so that real ulceration is produced by friction of the mucous membrane. It may also result from the use of a pessary. In both of these cases, however, there is little difficulty in deciding as to the cause of the hæmorrhage. It is not uncommon to find a single mucous or fibroid polypus, or a crop of polypi in an elderly woman. These, of course, must always be regarded with some suspicion; but innocent polypi undoubtedly occur after the menopause and may give rise to bleeding. There are many cases recorded in which a fibroid tumour has occasioned profuse hæmorrhage after the menopause. I think we are justified in saying that a true fibroid of the uterus rarely, if ever, originates or increases in size after a well-defined menopause has been reached, but a tumour of this sort, which has previously given rise to little or no trouble, may begin to cause bleeding after many years of

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amenorrhœa. This means that the tumour has become submucous or polypoidal. In adult life an interstitial fibroid may be gradually driven towards the uterine cavity by the contractions of uterine muscle. In elderly women a corresponding change of position is probably due to atrophy of the tissue which lies between the tumour and the uterine cavity. In both cases the tumour travels in the direction of least resistance, and whenever its capsule projects into the uterine cavity, bleeding is almost certain to occur.

The fourth class of case in which hæmorrhage may occur from the uterine cavity apart from malignant disease is that of endometritis. While senile endometritis undoubtedly exists, it is rarely associated with hæmorrhage, and some writers deny the existence of such a condition. A case, however, which has come under my own observation proves that an inflammatory condition of the endometrium in a senile uterus may give rise to symptoms which are exactly those of cancer of the body. The patient was a married woman (multipara) of sixty years of age, who was admitted to St. Mary's Hospital in April, 1906, complaining of a yellow, offensive discharge, which had latterly been tinged with blood, and which had been going on for six weeks before admission. There was no pain, but she had lost flesh during the previous eight weeks. On examination, the discharge seemed so characteristic of cancer of the body of the uterus that I performed vaginal hysterectomy without a preliminary curetting. The appearance of the uterus is shown in fig. 9. It will be seen that the whole of the surface of the uterine cavity is studded with small, rounded projections. To the naked eye the appearance suggests a diffuse carcinoma. The microscope, however, failed to show any change typical of malignant growth. On the other hand, there was atrophy of glandular structures and increase of fibrous tissue elements in the endometrium (see figs. 10 and 11). Cases of this sort, occuring so many years after the menopause, must be extremely rare. Cases of chronic metritis with endometritis may very easily be confused with cancer of the body when they are found in women soon after the climacteric or before it is thoroughly established, but a diagnostic curetting should settle the question.

Results of operation. The operation performed in all my cases of malignant disease of the body of the uterus was vaginal hysterectomy, with the exception of one case (case 4) in which

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Fig. 9.—Non-malignant endometritis in a senile uterus.

Fig. 10.—Microscopic section taken from uterus shown in Fig. 9. The mucosa showing the gradual disappearance of the glands and the cellular condition of the interglandular stroma due to chronic inflammation. The photograph shows at its lower part the dilatation of a gland acinus with retention of contents and atrophy of the epithelium.

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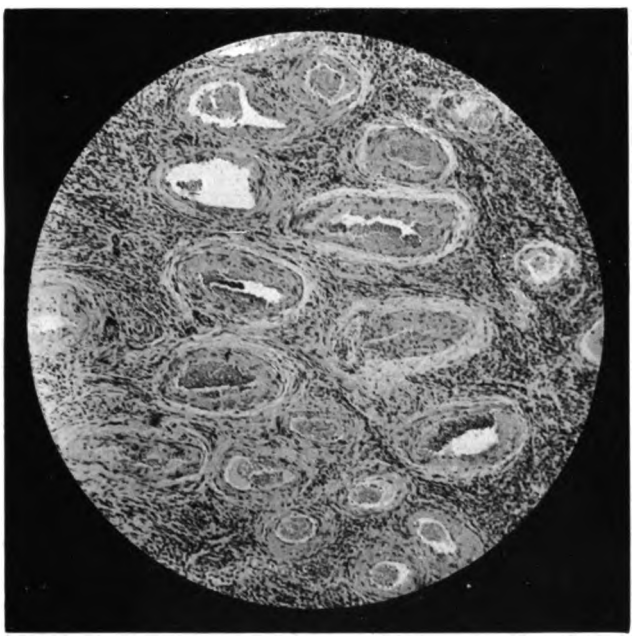

Fig. 11.—Section taken from uterus shown in Fig. 9. Group of blood- vessels situated in the inflamed mucosa and showing thickening of the walls by overgrowth of fibrous tissue which is undergoing hyaline degeneration. The surrounding tissue shows the cellular infiltration of chronic inflammation.

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No.	Name, State, and Age	Disease	Result of Operation. Immediate	Remote
1	Mrs. G. W. 55	celled sar-	Recovered	In good health at present date 12 years after operation.
2	Mrs. L, M. 50	and spindle- sarcoma in- g fibroid	Recovered	Recurrence— Death in October, 1900 about 18 months after operation.
3	Mrs. D. W. 67	ar cinoma	Recovered	In good health 2 years after operation, since then not heard of.
4	Mrs. G. M. 52	ar cinoma	Recovered	Died Sept. 18th, 1904, 6 months after operation, presumably from recurrence.
5	Mrs. J. M. 54	ar cinoma	Death 48 hours after operation.	--
6	Mrs. M. M. 51	ar cinoma	Recovered	Died Aug. 19th, 1906, 19 months after operation, presumably from recurrence.
7	Miss R. 49	ar cinoma	Recovered	In good health at present date.
8	Mrs. P. M. 51	ar cinoma	Recovered	In fair health at at present date.
9	Mrs. M. W. 65	ar cinoma	Recovered	In good health at at present date.
10	Mrs. H. W. 66	carcinoma e to squa- lioma.	Recovered	In good health at present date.
11	Mrs. R. W. 67	ule car	Recovered	--

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abdominal hysterectomy was performed on account of the largeness of the uterus and the narrowness of the vagina. In the nine operations for adeno-carcinoma, one was fatal (case 5). Death occurred in two of the remaining eight cases as a result of recurrence of the growth (cases 4 and 6); in one, six months, and in the other nineteen months after the operation. Up to the present time there has been no recurrence in the remaining six cases, but in two of these only a short period (seven months and three months) has elapsed since the operation. Three of the remaining four patients are well after intervals varying from thirteen to twenty months. The fourth patient cannot be traced, but she was known to be well two years after the operation. These results, so far as recurrence in concerned, are not so good as statistics would have led me to expect. At the best, there is only absence of recurrence in six cases out of eight. I think the explanation of this is to be found in the fact that the disease in both of the cases in which it recurred was very advanced at the time of operation. In one (case 4) the uterus was very much enlarged, and in the other (case 6) the microscopic sections showed that the cancer had penetrated deeply into the muscle.

Of the two patients who suffered from sarcoma, one is alive and well after an interval of 12½ years, but the other died from recurrence 18 months after operation.

In conclusion, I have to thank Professor Lorrain Smith for much valuable help and advice. He has gone over each specimen with me, and has carefully examined each microscopic section and has written the description underneath each microphotograph. Dr. W. Fletcher Shaw, House Surgeon to St. Mary's Hospital, has given me much assistance, as he has collected for me many of the notes, specimens, and microscopic sections which form the groundwork of this communication.

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CHOLESTERIN: SOME ACCOUNT OF ITS CHEMICAL, PHYSICAL, AND BIOLOGICAL RELATIONS.

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IN the latter part of the 18th century Conradi (1775) and Gren (1788) remarked upon the existence in gall-stones of a peculiar substance, which, from its general characters and its behaviour towards solvents, they regarded as being of a fatty nature and accordingly termed it gall-stone fat. Fourcroy, subsequently, coming to a similar conclusion, classed it along with Spermaceti and Adipocere, which expression of its chemical relationship was maintained until Chevreul (1815) demonstrated certain differential features and gave it the name of Cholesterin.

Subsequent investigations have established this constituent of the gall-stone as a well-defined chemical entity more closely allied to the Terpenes than to the Fats and as one, and the most definitely characterised, of a group of closely allied or isomeric substances widely distributed in organic nature. By repeated and careful analyses and by histological investigations it has been shown not only that cholesterin is a not infrequent phenomenon of many retrograde pathological processes, but that it, or some substance isomeric with it, is a constant constituent of every normal tissue, animal and vegetable; a distribution which by its constancy and range would seem to proclaim for cholesterin and its congeners a fundamental and constitutive significance. To the human physiologist and pathologist, however, cholesterin appears to have chiefly claimed attention in its more manifest and pathological sequence and particularly so as a factor in that much belaboured problem— the gall-stone— while the more essential and fundamental biological problems which these substances must sustain have in consequence been over-shadowed and to some extent lost sight of. It thus appeared that some useful purpose might be served by an

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estimate of our present knowledge of cholesterin and its congeners in their chemical, physical, and biological relations, and this has been undertaken the more readily, as the writer, attracted some years ago to this recondite province of biochemistry, has intermittently pursued investigations into these aspects of the subject and with results, which though barely commensurate with the energy expended, have by accumulation apparently attained an importance that merits their record.

THE PHYSICAL AND CHEMICAL PROPERTIES OF CHOLESTERIN.

Cholesterin (Cholesterol: Cholestenol) as obtained from the gall-stone or from nervous tissue is an odourless, somewhat unctuous, colourless, crystalline substance, insoluble in water, in solutions of the caustic alkalies, and in dilute mineral acids; on the other hand, it is soluble in most organic solvents and more abundantly on heating, it is readily soluble in chloroform, ether, acetone, ethyl acetate, carbon bisulphide, benzene, etc., at ordinary temperatures, less so in petroleum ether, volatile and fatty oils, in fatty acids, in the salts of the bile acids, and still less in solutions of soaps. In ethyl alcohol it is only slightly soluble in the cold but readily so in boiling alcohol.

Absolute ethyl alcohol, 17°·5C. dissolves 1·086 % (Hürthle).
Ethyl alcohol, Sp. Gr. 0·84 boiling dissolves 11·09 % (Chevreul).
„ „ 0·82 „ „ 20 % (Chevreul).
Petroleum ether, Sp. Gr. 0·7522, at 19°C. dissolves 0·832 % (Bömer).
„ „ 0·7522, at 23°C. „ 1·038 % (Bömer).

In solution cholesterin is optically active, exerting a lævorotatory effect on a beam of plane polarised light. Its specific rotatory power has been determined for ethereal solution to be:—

$\alpha_D^{15°} = -31·59$ (8 grammes in 100cc. ether).—Lindenmayer.

$\alpha_D^{15°} = -31·12$ (2 grammes in 100cc. ether).—Hesse.

$\alpha_D^{15°} = -29·92$ (4-6 grammes in 100cc. ether).—Burian.

My own determinations accord very closely with those of Burian.

The average of three observations on cholesterin from gall-stones gave:—

$\alpha_D^{15°} = -30·31$ (2·998, 3·897, 4·576 grms. in 100cc. ether).

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The average of two observations on cholesterin from blood gave:—

$\alpha_D^{15°} = -29{\cdot}65$ (3·001, 3·879 grms. in 100cc. ether).

The average of three observations on cholesterin from brain gave:—

$\alpha_D^{15°} = -30{\cdot}01$ (3·8772, 5·312, 6·0012 grms. in 100cc. ether).

For chloroform solution the specific rotatory power is:—

$\alpha_D^{15°} = -36{\cdot}61$, 0·249d. (2-8 grms. in 100cc. chloroform).—Hesse.

From its solution in dry ether, chloroform, petroleum ether or benzene, cholesterin crystallises out in slender, silky needle-shaped crystals free from solvent; from boiling alcohol it crystallises out on cooling in transparent, glistening rhombic plates having acute angles of 76°·30′ or 87°·30′, the plates increase in size as the rate of cooling is diminshed, they are commonly of exceeding thinness and frequently overlie in such a manner as to give rise to the well known and often ambiguously described appearance of a rhombic plate with "a corner cut out." During the separation from hot alcoholic solution the initial crystals often appear to be of the acicular type, as a result of blunting of the obtuse angles and narrowing of the acute angles, but gradually pass into the true rhombic form.

From dilute alcohol it has long been held that cholesterin crystallises in combination with one molecule of water (Heinz), the rhombic plates on exposure to a dry atmosphere readily split and become opaque, gradually loosing their water of crystallisation. From anhydrous ethyl alcohol I have determined that cholesterin separates in combination with a molecule of alcohol in the typical rhombic plate, and in this resembles cholalic acid (Mylius).

Similarly from other solvents, ethyl acetate and the fatty acids cholesterin crystallises out associated with apparently an equimolecular proportion of the solvent.

Pure cholesterin melts sharply, without decomposition, at 145°—146°C. (148°·5C. corr: Reinitzer). It can be distilled unchanged in vacuo above 360°C., and also under ordinary

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pressures with careful heating. Its molecular refraction as determined by Kanonnikow is 200·88, and its molecular heat of combustion (constant volume) is 3836·4 cals. (Berthelot and Andre).

The empirical formula of cholesterin is not yet definitely established, the majority of determinations agree in that the molecule contains 27 carbon atoms and one oxygen atom, but differ with regard to the number of hydrogen atoms. According to Mauthna and Suida and van Oordt $C_{27}H_{44}O$ is the more probable formula, whilst other analyses as those of Reinitzer and Obermüller giving $C_{27}H_{46}O$ have been accepted by Diels and Abderhalden and recently by Windaus. A difference of two hydrogen atoms in a substance of such high molecular weight as cholesterin is one of extreme difficulty to establish and this technical difficulty is further increased by the facility with which cholesterin and its derivatives undergo inequable and incomplete combustion. From determinations of the molecular weight by Raoult's method, Abel concludes in favour of the composition $C_{27}H_{44}O$, which formula will be accepted in the present article.

By many reactions to which cholesterin is disposed it appears that the solitary oxygen atom of the molecule is contained in a secondary alcoholic hydroxyl group (CHOH), thus with acid anhydrides $(RCO)_2O$ and acid chlorides (ROCl) it reacts with the formation of ethereal salts or esters $C_{27}H_{43}OOCR$; with phosphorous pentachloride PCl_5 or thionyl chloride $SOCl_2$ it reacts in such a way that the hydroxyl (OH) group is replaced by chlorine giving cholesteryl chloride $C_{27}H_{43}Cl$, which on reduction is converted into the hydrocarbon cholesten $C_{27}H_{44}$; acted on in petroleum solution with metallic sodium or potassium, crystalline sodium or potassium cholesterylate is formed, and further, by the action of such dehydrating agents as phosphorous pentoxide, anhydrous copper sulphate, etc., water is abstracted from the cholesterin molecule leaving a mixture of isomeric hydrocarbons—cholesterylenes $C_{27}H_{42}$—of varying optical activity and melting at from 79°—80°C. On oxidation with CuO the hydroxyl containing group is changed into a ketonic group.

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Further, since cholesterin readily takes up one molecule of a halogen—Br_2, Cl_2, I_2—forming stable crystalline addition products, e.g., cholesterin dibromide (dibrom-cholestanol) $C_{27}H_{43}Br_2OH$, or one molecule of hydrogen chloride forming cholesterin hydrochloride (chlor-cholestanol) $C_{27}H_{44}ClOH$, it appears that the cholesterin molecule is unsaturated to the extent of two hydrogen atoms and that accordingly it possesses a double linking between two of its carbon atoms.

It may thus be regarded as established that cholesterin is an unsaturated secondary alcohol $C_{26}H_{42}CHOH$, derived from the unsaturated hydrocarbon cholesten $C_{27}H_{44}$, and, being optically active, that its molecule contains at least one asymmetrically disposed carbon atom. Beyond this very little is as yet demonstrated of its molecular constitution.

The not inconsiderable labours which such investigators as Mauthna and Suida, during the last twenty years, and Windaus, and Diels and Abderhalden, during more recent years, have expended on attempts to elucidate the problem of the constitution of cholesterin have so far yielded insignificant results, making us acquainted with certain peculiarities of the fringe of the large molecule and serving by analogy to more and more confirm the early speculations of Walitzky, Liebermann, and Weyl that the substance belongs to the complex terpenes.

Consideration of the formula of the unsaturated hydrocarbon cholesten $C_{27}H_{44}$, from which cholesterin is derived or of the corresponding hypothetical saturated hydrocarbon cholestan $C_{27}H_{46}$, shows by the deficiency in the number of hydrogen atoms in the molecule to accord with either the normal paraffins—C_nH_{2n+2}—or the olefines—C^nH_{2n}—that these bodies must be wholly or in part of cyclic structure, and from the manner in which cholesterin reacts with cold concentrated nitric acid it would further appear that the rings constituting the cholesterin molecule are reduced rings and that the molecule contains no structure corresponding to the benzene ring. When cold contrated nitric acid reacts with a benzene derivative, characteristic aromatic nitro- compounds are formed, but under similar conditions as shown by Mauthna and Suida and Windaus cholesterin yields a nitrosate or nitrosite by a reaction analogous to that

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investigated by Tönnies and Wallach in the nitration of phellandrene.

Cholesten, which then may be regarded as being built up, wholly or in part, of reduced rings, is obtained by the reduction of cholesteryl chloride; it crystallises in colourless needles, melting point 89°—90°C., and is lævorotatory, $\alpha_D = -56{\cdot}29$ (chloroform solution) Mauthna and Suida. Like its alcohol cholesterin, it readily takes up one molecule of a halogen, forming addition products, which on reduction yield, not the saturated dihydrocholesten or cholestan, but the original hydrocarbon cholesten. This peculiar behaviour of the halogen addition products of cholesten on reduction is equally characteristic of those of cholesterin itself, and from this Mauthna and Suida conclude that the double bond in the original molecule is not of the usual ethylene type—HC:CH—but probably $H_2C:C<$. Towards reducing agents cholesterin equally with its dihalogen derivatives is peculiarly resistent, and until quite recently all attempts at the production of the hydrocarbon cholestan had proved abortive, and it remained known only in a series of derivatives in which the saturation was completed in other ways than by the interpolation of a molecule of hydrogen. An exception to this statement apparently exists in the substance discovered by Bondzyński and Humnicki, coprosterin, which they regard as dihydrocholesterin $C_{27}H_{45}OH$, but this I shall have occasion to discuss later. In 1906, however, Diels and Abderhalden, and Neuberg announced independently that by the action of metallic sodium in boiling amyl alcohol on cholesterin a product is obtained which is dextro-rotatory, melting point 119°—126°C., and which is incapable of adding a molecule of a halogen. This product they regard as resulting from saturation of the cholesterin molecule by two atoms of hydrogen—$C_{27}H_{45}OH$—dihydrocholesterin or αcholestanol, that is, the alcohol having the same relation to the saturated hydrocarbon cholestan as cholesterin bears to the unsaturated hydrocarbon cholesten.

Whilst Diels and Abderhalden maintain that this αcholestanol has no relation to the substance coprosterin, Neuberg, on the other hand, regards the latter as an impure α cholestanol; an

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interesting reflection on the curiously accurate combustions of Bondzyński and Humnicki. Still more recently, Windaus succeeded in obtaining a product identical with this α cholestanol by the action of preformed sodium amylate on cholesterin, and he regards it not as reduction product, but as a cyclo-cholesterin produced by a transformation of the olefine linking of the cholesterin molecule into a cyclic linking, a change which, whilst rendering the substance saturated, does not entail the addition of a molecule of hydrogen. It thus appears doubtful whether reduction products of cholesterin have even yet been obtained.

Towards oxidising agents cholesterin is much less resistant. Even when maintained at a temperature of from 95°—100°C. for a few days in the drying oven it gradually becomes discoloured, and its melting point is lowered, a change, as shown by Mauthna and Suida, to be due to slight oxidation. In a specimen which had been exposed at a temperature of 96°C. for four weeks these observers found an increase of 2 per cent. of oxygen. More recently it has been pointed out by Schultze and Winterstein that cholesterin exposed to sunlight in the presence of air also undergoes slow oxidation, its melting point in two years being lowered to 115°—137°C. and 108°C., an effect which was also noted to occur in the case of other members of the cholesterin group.

Cholesterin shaken up with an ethereal solution of hydrogen peroxide, " ozonic ether " so-called, also, as I noted some time ago, has its melting point considerably lowered, a result, I believe, of oxidation.*

The more vigorous oxidation of cholesterin by such agents as nitric acid, chromic acid, hypobromic acid and potassium permanganate, which has been undertaken by all investigators with a view to the elucidation of its molecular structure, has yielded, among the better characterised products, a series of derivatives of cholesten and cholestan, and in many instances the reaction would appear to run in an analogous way to well-defined oxidations in members of the terpene series of known constitution.

* The products obtained by this method of oxidation have not been investigated, although it is possible that such may yield information of constitutive importance.

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The earlier investigators obtained amorphous substances of doubtful constitution and of little significance. To Mauthna and Suida belongs the credit of having been the first to obtain definite crystalline products of oxidation.

Employing chromic acid, they obtained as chief products of oxidation three neutral substances :—

α Oxycholestenol—$C_{27}H_{42}O_2$—an unsaturated secondary alcohol, in which the function of the second oxygen atom, which is also present in the other products, could not be determined.

Oxycholestenon—$C_{27}H_{40}O_2$—the corresponding ketone, in which it was left undecided whether it still contained the double bond.

Oxycholestendiol—$C_{27}H_{42}O_3$—the glycol, which was readily transformed by dehydration into oxycholestenon.

From cholesteryl chloride the chief product obtained was oxychlorcholestenon—$C_{27}H_{43}OCl$—and from cholesteryl acetate they obtained the acetyl derivatives of the above substances.

These results were confirmed by van Oordt, and he found that on attempting to obtain oxycholestenon from the oxycholestendiol by means of alcoholic hydrogen chloride the chief product was a substance which, Windaus showed, was the ethyl ester of oxycholestenon. In this he was able to prove the existence of a carbonyl group—CO—and accordingly concluded that the second oxygen atom of oxycholestenon, whose function had been in doubt, must exist in a hydroxyl group, probably in tertiary combination. Windaus concluded that in the oxidation of cholesterin the first stage is the change of a tertiary CH group to C·OH (oxycholestenol), and, further, the oxidation of the secondary CH·OH group to CO (oxycholestenon). In both these products a double bond should still exist. On reducing oxycholestenon he obtained a saturated diketone—cholestandion $C_{27}H_{42}O_2$—which he had previously obtained by the oxidation of cholestanon-ol; from this he concluded that oxycholestenon must be an unsaturated diketone in which one of the CO groups may react in the enolic form. Oxidising cholestandion, he obtained a ketodicarboxylic acid—$C_{27}H_{42}O_5$. This change, corresponding with the formation of camphoric acid from camphor, would indicate the existence in cholestandion of a ring

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containing a group—CO—CH_2—which on oxidation splits at the ketonic group. The ketodicarboxylic acid yielded a stable anhydride from which it would appear that the carboxyl groups must occupy the 1 : 5 positions. Continuing on these lines, Stein, starting with chlorcholestenon $C_{27}H_{43}OCl$, obtained an oxydicarboxylic acid, and on further oxidation a ketodicarboxylic acid, and, finally, with the opening of a ring, a tetracarboxylic acid. Windaus having previously shown by his results the probability of the secondary OH group of cholesterin being situated in a reduced ring, this work of Stein would seem to indicate the existence of a second reduced ring in the molecule in which is contained the double bond.

Employing potassium permanganate as the oxidising agent, Windaus obtained a product containing three OH groups, Triol, which on further oxidation with CrO_3 gave a body isomeric with the oxycholestendiol of Mauthna and Suida; this trioxy substance would thus appear to be the alcohol corresponding to the saturated diketo-alcohol, oxycholestendiol.

Diels and Abderhalden, using sodium hypobromite, obtained from cholesterin a dicarboxylic acid—$C_{27}H_{44}O_4$—which, like camphoric acid, yields an acid ester on direct esterification, the neutral ester being obtained by reacting on the silver salt with alkyl iodide. From this they conclude that whilst one of the carboxyl groups is in the primary or secondary position the other is tertiary, and since cholesteryl chloride under similar conditions does not yield this acid, it follows that the oxidation begins at the OH group of the cholesterin molecule.

In 1903 Pickard and Yates announced that they had obtained from cholesterin by oxidation, arachidic acid—$C_{20}H_{40}O_2$—which would indicate that the cholesterin molecule contains a normal chain of 19 carbon atoms; this statement has, however, not been confirmed.

More vigorous oxidation with hot concentrated nitric acid yielded to Mauthna and Suida certain amorphous tetrabasic acids readily soluble in water and which appeared to be carboxylic derivatives of hydrocarbons having the formula C_nH_{2n}.

Windaus by similar means obtained, among the products of

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oxidation, dinitroisopropane, from which he concluded that the cholesterin molecule contains the group $(CH_3)_2C<$.

The results of the investigations into the constitution of the cholesterin molecule thus far obtained would seem to afford reasonable ground for regarding this substance as constituted by a series of reduced rings, and that it accordingly belongs to a class of substances quite distinct from the three great constitutive classes of animal substances—proteids, fats and carbohydrates—namely, the terpenes, representatives of which have hitherto invariably been associated with plant life.

Reactions of Cholesterin: The properties which appear most useful for the identification of cholesterin are the melting point and the specific rotatory power. Beyond these cholesterin and its derivatives give certain colour reactions which usefully serve the same purpose.

1. Hesse-Salkowski reaction. On the addition of an equal volume of concentrated sulphuric acid to a solution of cholesterin in chloroform and slightly shaking, the chloroform solution becomes blood red and changes to cherry red and then to purple; with only a trace of cholesterin the colour is lemon yellow, on being poured off into a basin the chloroform solution becomes blue, then green, and finally yellow. The layer of sulphuric acid below the chloroform presents a green fluorescence and on the addition of acetic acid it becomes rose or purple red with a green fluorescence.

2. Liebermann-Burchard reaction. Cholestal reaction. On the addition of acetic anhydride—and concentrated sulphuric acid—drop by drop to a solution of cholesterin in dry chloroform, the fluid becomes rose red, then violet, blue, and finally green. Even with traces only of cholesterin this reaction appears within a few minutes.

3. Obermüller's reaction. Dry cholesterin melted with a few drops of propionic anhydride gives on cooling a brilliant play of colours: violet, blue, green, orange, and copper red in this order, which are particularly well seen when some of the molten substance is allowed to cool on a glass rod held against a black back-ground.

4. Schiff's reaction. A mixture of cholesterin, chloroform,

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hydrochloric acid, and a trace of ferric chloride is evaporated in a basin till the edges begin to assume a violet-red colour, then after cooling more chloroform is added, the mixture evaporated to dryness and heated, when it becomes purple, then blue, and finally green.

5. Neuberg and Rauchwerger's reaction. A solution of δ Methylfurfurol is added to an alcoholic solution of cholesterin, then on the addition of the same volume of concentrated sulphuric acid a red ring appears at the junction of the two fluids, and on shaking, the fluids being kept cool, the whole fluid assumes this colour and spectroscopically gives an absorption band from E to *b*.

This reaction is also given by phytosterin, bile acids, and a large series of hydroxyl containing compounds.

6. Hirschsohn's reaction. A solution of trichlor-acetic acid in hydrochloric acid gives a red colour with cholesterin.

7. As a microscopic reaction. Crystals of cholesterin on treatment with concentrated sulphuric acid and a trace of iodine are coloured violet, then blue, green, and finally red.

Certain differences have been established in the reactions of the derivatives of cholesten and cholestan. The Hesse-Salkowski reaction is specially characteristic of members of the cholesten series, those of the cholestan series yielding either an insignificant or no colour reaction with sulphuric acid. The Liebermann-Burchard reaction on the other hand is given by members of both series.

RELATION OF CHOLESTERIN TO FATTY ACIDS, FATS AND SOAPS: In describing the solubility relations of cholesterin it was incidentally mentioned that this substance is soluble in fatty acids, in neutral fats (glyceryl esters), and slightly in the sodium and potassium salts of these acids (soaps). This property may, in view of the existence of cholesterin in the tissues in a dissolved form be possessed of some importance, and accordingly calls for further consideration.

*Cholesterin and Fatty Acids.** It has long been recognised

* Details of this particular branch of my investigations in which a comparison of the physical properties—melting point, rotatory power, depression of freezing point of solvents—of the cholesterin acid mixtures and the cholesteryl esters is being worked out, will be published subsequently.

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that cholesterin is soluble in certain fatty acids on heating, and particularly so in acetic acid, and that from solution in the latter it crystallises out in combination with one molecule of the acid (of crystallisation) in needle-shaped crystals which melt sharply at 110°C., and on heating to 120°C. are decomposed into their two components, as also happens when the crystals are treated with water or alcohol (Lindenmayer). Similarly two molecules of cholesterin will crystallise out in combination with one molecule of oxalic acid, which association seems to be of a similar nature to the foregoing.

This peculiarity of cholesterin to crystallise out from its solution in a fatty acid in combination with an equimolecular proportion of the fatty acid has apparently been misunderstood inasmuch as some recent observers have regarded this association as being of the nature of an ethereal salt. Salkowski in a recent paper gives as a method for the preparation of the cholesterin esters of palmitic acid and stearic acid, etc., that the acid and the cholesterin dissolved in ether be mixed in equimolecular proportions, when on the addition of 95 per cent. alcohol the ester required will be thrown down in a pure form and of the correct melting point. My own observations on the relation of cholesterin to the fatty acids appear to indicate that whenever cholesterin crystallises out from solution in a fatty acid, or from a mixture in equimolecular proportions of cholesterin and a fatty acid dissolved in some anhydrous solvent (petroleum-ether, benzol, ether), it invariably does so in combination with one molecule of the acid in uniform needle-shaped crystals of definite melting point, generally lower than that of the true ester. So far as these observations have proceeded this relation has been established for formic, acetic, propionic, butyric, oleic, palmitic and stearic acids, and accordingly it would seem to be a general phenomenon.

The true nature of the association is at once evident from the action on the crystals of water, alcohol, solutions of the alkaline carbonates and by heating them to a temperature above their melting point, any of which suffices to withdraw the acid from combination leaving the cholesterin which gives its true melting point.

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It would thus appear that we have to do with a purely physical association which is non-existent in solution and only comes into being with the phenomenon of crystallisation, that the relation of the acid to the cholesterin is that which obtains between water or alcohol and cholesterin when the latter crystallises from moist or anhydrous alcohol. These physical associations of cholesterin and fatty acids can, however, be readily converted into the true esters by the abstraction of water—

$$(C_{27}H_{43}OH)\,(HOOCR) = C_{27}H_{43}OOCR + HOH,$$

as happens when they are heated in the presence of a considerable excess of acid. The compounds so obtained are unaltered by water, alcohol or sodium carbonate, and are only with considerable difficulty saponified by the caustic alkalies.

Ethereal Salts of Cholesterin. These are most readily obtained by the action of acid anhydrides—$(RCO)_2O$—or acid chlorides —RCOCl—on dry cholesterin, and in a yield approximating to the theoretical; they are also produced as has already been indicated by heating cholesterin with four to six times the theoretical amount of the dry acid, the yield is comparatively poor and the purification of the product is tedious: the general method of acting on cholesteryl chloride with the silver salt of the acid is in my experience a reaction that is extremely difficult to conduct and proceeds very incompletely: a further method of which I have had experience, that of introducing dry hydrogen chloride into a mixture of cholesterin and the fatty acid, either with or without zinc chloride, also gives a poor yield and a product that requires much purifying.

By one or other of the first three methods a large number of these ethereal salts have been prepared of the fatty and also of the aromatic acids, and their properties investigated by Berthelot, Obermüller, Hürthle, Lehmann, and Jaeger.

In a pure state the cholesteryl esters are well defined crystalline substances, less easily saponifiable than the ordinary fats, and having a solubility less than cholesterin itself especially so in alcohol, a property which is of use in their purification.

Many of them, especially those of the lower fatty acids, exhibit a beautiful play of colours when passing from the molten

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to the solid state, a property which is the basis of Obermüller's characteristic reaction for cholesterin.

As was first pointed out by Lehmann, certain of the cholesteryl esters exhibit during the passage from the solid to the molten isotropic fluid state, an intermediate anisotropic phase in which the substance, whilst possessing all the physical characteristics of a fluid has a turbid appearance and is doubly refractive: the existence of this anisotropic or fluid crystalline phase has been proved by Jaeger for a large series of cholesteryl esters prepared by himself, and he has shown that whilst in certain esters the phase is one of considerable stability in others where previously its existence was not suspected it is extremely labile under ordinary pressure relations and can only be demonstrated on the rapid cooling of the isotropic molten substance to a temperature below its melting point.

It would further appear from the investigations of Lehmann and Jaeger that the anisotropic phase consists of at least two distinct phases or in some cases, e.g., cholesteryl cinnamylate of a series of phases. This phenomenon which is also exhibited by certain azoxy-compounds is of doubtful significance, it has been regarded as being caused by the presence of impurities or at least of isomeric substances. Jaeger, however, who failed to observe it in the esters of phytosterin which as will be pointed out is probably a mixture of at least two substances, believes it to be essentially a constitutive property. Adami and Aschoff investigating this phenomenon in its biochemical relations apparently endowed it with a significance far more exclusive than their methods could possibly permit, and Powell White from a more extensive examination of the various factors involved, has demonstrated that the existence of an anistropic fluid even when it contains cholesterin does not necessarily imply the presence of cholesteryl esters.

The esters which it is believed exist preformed in the tissues of the animal organism are those of oleic, palmitic, and stearic acids. These esters as isolated from blood serum and prepared synthetically were found by Hürthle to have the following properties:—

Cholesteryl oleate: Crystallises in long thin colourless

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needles; melting point 42°C., $\alpha_D = -18{\cdot}48$ (d = 7·94, alcohol + chloroform). Its solubility in absolute alcohol at 17°·5C. is ·398%. It gives the cholesterin reactions in a modified form.

Cholesteryl palmitate: Crystallises in silky platelets which rapidly become opaque and white; melting point 77°—78°C. It is less soluble than the oleate, and gives the cholesterin reactions in a still more imperfect manner.

Cholesteryl stearate: Crystallises in white platelets, melting point 82°C. (85°·5C. Herbig), it is less soluble than the palmitate.

It is generally stated that the esters of cholesterin possess the property of absorbing considerable quantities of water, swelling up into a fatty mass, ordinary lanoline being regarded as a mixture of such hydrated cholesteryl and other esters. A number of pure synthetic esters which I have prepared including the oleate and the palmitate, give no indication of this property, whilst I have repeatedly noted that it is a striking phenomenon of the physical mixtures of cholesterin and fatty acids, and to a less extent also of cholesterin and neutral fats.

Cholesterin and Neutral Fats: Cholesterin dissolves on heating in all neutral fats. This mixture as I have noted forms a more permanent emulsion with water than does the fat alone, and if a large amount of cholesterin is employed, namely equal weights, a thick greasy mass is obtained, which swells up with water in a manner which is usually ascribed to the esters of cholesterin.

From this mixture of cholesterin and fat, it is practically impossible to isolate the cholesterin without resorting to saponification, and by fractional crystallisation from hot alcohol one occasionally obtains needle-shaped crystals, which, however, give no constant melting point.

Cholesterin and Soaps: Cholesterin is soluble to a slight extent in sodium and potassium salts of the fatty acids and more abundantly in those of taurocholic and glycocholic acids (Bile salts).

COPROSTERIN: This substance isolated by Bondzyński (1896) from human fæces, and apparently the principal constituent of the Excretin of Marcet (1860) and Hinterberger (1873) and of the

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Stercorin of Flint (1862), would appear from the investigations of Bondzyński and Humnicki to be a reduction product of cholesterin. From the latter it differs in several particulars, it is more readily soluble than cholesterin and from cold absolute alcohol in which it is easily soluble it crystallises in long thin needles; its melting point is 95°—96°C., it is dextrorotatory, its specific rotation being $\alpha_D = +24°$. It gives the colour reactions of cholesterin in a modified form, it does not, however, give Obermüller's reaction.

As this substance refuses to add a halogen molecule it would appear that its molecule is saturated. Like cholesterin, it contains a hydroxyl group and yields a number of well characterised esters.

The analyses of coposterin and certain of its esters by these two observers indicate that its empirical formula is $C_{27}H_{48}O$ and accepting cholesterin as $C_{27}H_{46}O$, they regard it as dihydrocholesterin.

In view of the conclusions of Bondzyński and Humnicki, it is of interest to note that all attempts to reproduce this substance *in vitro* by the reduction of cholesterin—both by chemical and bacterial methods of reduction—have so far yielded negative results. The recent investigations of Neuberg and of Diels and Abderhalden which have already been referred to, in which they believe they obtained the dihydrochlesterin are particularly noteworthy, as, assuming that the product which they obtained had this nature, it presents very striking differences from the apparently very homogeneous substance isolated by Bondzynski. Further, it is of interest to note that where the saturation of the cholesterin molecule is brought about by halogens, the optical activity of these halogen derivatives of cholestanol is like that of cholesterin itself lævorotatory.

Working at the time (1904) with W. J. Pope, all methods of reduction were employed, including metallic sodium in boiling amyl alcohol, but we were unable to obtain from cholesterin any product having the properties of Bondzyński's coprosterin.

More recently (1906) repeating the observation of Bondzyński

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and Humnicki that cholesterin administered to the human subject is excreted as coprosterin, I obtained a negative result. Five grammes of pure cholesterin mixed with butter was administered to a healthy subject, and from the fæces 4·6 grammes of cholesterin were isolated, but no substance corresponding to coprosterin.

HIPPOCOPROSTERIN: An allied substance isolated by Bondzyński and Humnicki and others from horse dung, which they regard as a further reduction product of cholesterin $C_{27}H_{50}O$. Gittelmacher-Wilenko has recently succeeded in isolating two hippocoprosterins. The α, which is easily soluble in 97% alcohol, crystallising in thin rhombic plates, and melting at 65°—67°C., and in benzol solution is optically inactive. The β only slightly soluble in alcohol, crystallising in needles, melting at 56°C., and in benzol solution is slightly dextrorotatory.

ISOCHOLESTERIN: This term is applied to a somewhat ill-defined substance, or possibly a mixture of several isomeric or closely allied substances isolated by Schultze from wool-fat, in which it exists along with cholesterin in association with the higher fatty acids, and with which they are generally regarded as being combined, in the form of ethereal salts. It also has been isolated from the vernix caseosa.

Its empirical formula is said to be the same as that of cholesterin, $C_{27}H_{44}O$, from ether and acetone it crystallises in fine transparent needles, from strong alcohol it separates on cooling as a gummy mass, or on the addition of water in white flocculi, it melts at 137°—138°·5C. Like cholesterin it adds a halogen molecule, it is optically active, being dextrorotatory, $\alpha_D = +60$ (7 grammes in 100cc. ether), a property which suggests that it may in some way be related to the so-called coprosterin. It gives the cholesterin colour reactions in a modified form.

PHYTOSTERIN: A generic term applied by Thoms to include the many substances isomeric with or allied to cholesterin, isolated from plants. They resemble cholesterin in empirical composition, $C_{27}H_{44}O$, in crystalline form from alcohol and from ether, in containing an alcoholic hydroxyl group, and in adding a halogen molecule. They differ from it and also

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among themselves in melting point and in specific rotatory power, as will be seen in the following table:

Name.	Source.	M.P.	α_D	Observer.
Phytosterin	... Calabar bean	132 – 133	... – 34·2 $CHCl_3$	... Hesse
Do.	... Colchicum seeds ...	133	... – 32·7 $CHCl_3$	... Paschkis
Cholesterin	... Beans ...	131·5 – 132·5	... – 32·39 – 31·95	... Jacobson
Do.	... Vetch ...	134 – 135	... – 31·94 – 32·6	... Do.
Do.	... Peas ...	132 – 133	... – 30·53 – 30·41	... Do.
Do.	... Lupines ...	135·5 – 136·5	... – 34·43 – 32·95	.. Do.
Phytosterin	.. Lupine ...	136 – 137	... – 36·4 $CHCl_3$	... Schultze and Barbieri
Do.	... Pisum sativum ...	135	... —	... Likiernik
Paraphytosterin	... Phaseolus vulgaris ...	149 – 150	... – 44·1	... Do.
Caulosterin	...Lupine germs	158 – 159	... – 49·6 $CHCl_3$	... Schultze and Barbieri
Paracholesterin	...Aethalium septicum ...	134 – 134·5	... – 28·88 – 27·24	... Reinke and Rodewald
Hydrocarotin	... Carrot ...	136·5	... – 35	... Arnaud
Do.	... Do. ...	137·4	... – 37·4	... Reinitzer
Ergosterin	.. Secale Cornutum ...	154	... – 44	... Tauret
Phytosterin	... Barley ...	137 – 138	... —	... Wallerstein
Sitosterin	...Rye & wheat...	137·5	... – 26·87 – 26·55	... Burian.
Parasitosterin	... Do. ...	127·5	... – 20·8	... Do.

The several members of this group of plant cholesterins present so little difference in the essential characters of melting point and rotatory power, that Ritter raised the question of their individuality and expressed the opinion that they all might very well be one and the same substance, in which varying impurity was responsible for such differences as had been noted. It might also be possible that many samples were mixtures of two different phytosterins and the variable properties due to their being associated in different proportions. Bömer had noted that the addition of cholesterin to phytosterin raised its melting point, then Windaus and Hauth definitely established the validity of the view of Ritter for the phytosterin isolated from the Calabar bean. From this substance they isolated two distinct bodies, one having all the properties of the sitosterin isolated by Burian and Ritter which was present to the extent of 80%, the other stigmasterin, $C_{30}H_{48}O$, which was capable of adding two molecules of a halogen.

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The Biological Relations of Cholesterin.

The constant and wide distribution of substances of the cholesterin group, suggesting a constitutive significance for them, in the vegetable and animal cell, has already been referred to, and now it remains to examine the data on which this generalisation is founded, and further to bring together such observations as have been accomplished which will tend to elucidate, or at least suggest the lines for further attack of the interesting problems of the origin and fate of these substances in the living cell and of the rôle they therein sustain.

The general occurrence of a cholesterin-like substance in the vegetable cell was first suggested by the work of Beneke, who isolated from various seeds and germs a substance which was identified by Kolbe as cholesterin, but which was subsequently differentiated by Hesse who had obtained it from the Calabar bean and termed it Phytosterin. Since these fundamental investigations, it has been shown that phytosterins, the variability of which, as already indicated, depends in all probability on the admixture of a cholesterin isomer, with variable quantities of other bodies of different molecular weight, exist in members of the vegetable series from the bacteria upwards. Thus they have been isolated from the fatty constituents of various bacteria, from the myxomycetes, from various moulds and algæ, from the higher fungi, and from the seeds, leaves, tubers, and stems of large numbers of the higher plants. A distribution which could doubtless be extended by further investigation, but which already renders it highly probable that phytosterin is a constitutive element of the plant cell.

Recalling what has been previously said of the probable chemical relations of cholesterin and its isomers, that they apparently belong to the complex terpenes (sesquiterpenes), other members of which series as well as the simpler members of the same organic group, are, as products of organic nature, derived entirely from the vegetable kingdom, the general occurrence of phytosterin in the plant cell is perhaps less striking than is its similar relation to the animal cell, and on physiological grounds Tschirsch regards phytosterin as a normal constituent of all

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vegetable protoplasm, and probably the mother substance of the closely related coniferous resins.

The occurrence of cholesterin and its congeners in members of the zoological series is less well known, though its distribution in the various tissues of the human being and some of the higher animals, has been much more completely established than is the case with the various tissues of the vegetable series.

In a microscopically invisible (dissolved or suspended) and physiological form, cholesterin is a normal constituent of the bile of all animals (except the Scymnus borealis, Hammarsten), it is a prominent constituent of all nervous tissue and also of the red and white corpuscles of blood and of the blood plasma, of all animals. In less amounts, it occurs in all normal cellular tissues, also in the cuticle of the skin and all keratinoid substances, hairs, feathers, hoof, etc., and in the fatty secretions of the cutaneous glands, sebaceum, vernix caseosa, dermoid cyst contents, and in the fat of sheep's wool (Lanolin). Occasionally its existence as a physiological product is indicated by its occurrence in a visible crystalline form, as in the cortical cells of the suprarenal capsule, and occasionally in the liver cells.

As a phenomenon of pathological processes of a retrograde type, cholesterin occurs in a visible crystalline form, in transudates and exudates—serous, hæmorrhagic, and purulent,—in hæmatomata, in mucous, sebaceous, and degeneration cysts, in morbid and to a less extent in normal secretions of mucous membranes, in the necrotic areas of atheromatous nodules, in the caseous material of tuberculous or syphilitic origin, in the degenerate and necrotic portions of neoplastic tissue, carcinomata in particular, and in gall-stones. In brief, cholesterin in a visible crystalline form is of usual occurrence whereever tissue elements of which it is a constituent are undergoing dissolution.

Realising the possibility of the occurrence of substances isomeric with or allied to cholesterin and of substances which might originate from it by oxidative processes in the tissues, it appeared that some useful purpose might be served by the examination of the cholesterin extract from various tissues as to the identity of the substances obtained, and, in view of its very definite behaviour towards inorganic solvents, it appeared equally

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important to endeavour to elucidate the particular manner of its association in the tissues. It is towards these points that such of my own observations as can be dealt with in this section, have been directed, and according to the following method :—

A definite weight of fresh tissue, finely minced, ground into a pulp with clean sand (washed and extracted), is mixed with twice its volume of strong alcohol (98%) and after standing a few hours, is filtered through fine linen on the pump, the residue dried in a vacuum desiccator, the filtrate evaporated on the water bath and its residue added to that in the desiccator In other cases dehydration was brought about by the use of plaster of Paris (Rosenheim) or by anhydrous sodium sulphate (Bünz). The dry, finely divided material is then extracted with ether in a Soxhlet or by repeated digestion. The ethereal extract divided into two equal parts, A and B, is evaporated to a small bulk, to each is added about 6 times its volume of dry acetone, previously cooled to 0°C. or below, and vigorously stirred or shaken to cause the precipitated lecithin to conglomerate, the ether-acetone extract containing the bulk of the cholesterin is poured off, the lecithin residue dissolved in a little ether and reprecipitated by cold acetone, this second ether-acetone extract is added to the first. Then, where a quantitative estimate of the cholesterin content of the tissue is required, the combined extracts from A are evaporated almost to dryness, dissolved in about 100cc. of alcohol on the water-bath and sodium ethylate (8 grm. sodium in 160cc. alcohol 99%) is added with constant stirring, and the mixture evaporated to dryness, to the dried residue about 100 grammes of NaCl is added and about 200cc. of water, the mixture well stirred, is again evaporated to dryness, and, further dried in the vacuum desiccator, and then extracted with ether in a Soxhlet's apparatus, the ether is distilled off, the residue treated with hot alcohol, diluted with water, and allowed to cool, the cholesterin which thus crystallises out is collected on a filter, washed with water, dried and weighed. The lecithin residue is then similarly treated with sodium-ethylate, etc., and any further cholesterin obtained added to the former. This precaution is soon found to be unnecessary, providing extraction with acetone has been thoroughly performed.

In the other portion, B, the ether-acetone extract is allowed to evaporate spontaneously, and as crystals appear they are filtered off, recrystallised from various solvents until of constant melting point, and the different crops compared one with the other. In this way it was hoped to detect the occurrence of allied substances by variations in melting point, and when sufficient material of constant melting point was obtained its optical activity was examined and its specific rotation determined.

Identity of Cholesterin from various sources: The cholesterin extracted, according to the method described, from brain, blood,

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and gall-stones of the human subject proved by the coincidence of melting point and specific rotatory power to be identical. That, similarly extracted, from normal liver, spleen, lymphatic glands (ox), bile, fæces, from atheromatous nodules of the aorta, a peculiar type of hepatic cirrhosis, an ischæmic infarct of the spleen, and from the fluid of an old hæmorrhagic pleural effusion, gave melting points ranging within 144°C. and 146°C., from which the identity of the cholesterin from these various sources with that of the gall-stone, may also be regarded as established. In no case was it possible to isolate any substance which could be regarded as a product of the oxidation of cholesterin, such being particularly sought after in the blood and in the liver. The facility with which cholesterin undergoes some degree of oxidation (*vide ante*) seemed to render it probable that such products would be met with, but so far as my own observations have proceeded this has not proved to be the case. Lifschültz, however, by a spectroscopic method, the significance of which it is difficult to estimate, believes that he has demonstrated such oxidation products (oxycholesterin, $C_{26}H_{42}(OH)_2$ and its ether-like predecessor, $[C_{26}H_{43}]_2O$, *sic*) in wool-fat and in the ethereal extract of bone marrow and of blood. In the former Lifschültz premises that the cholesteryl esters, in which combination cholesterin is generally believed to exist in wool-fat, are hydrolysed by the potash salts in the sweat and the free cholesterin exposed on the surface of the fleece to the air and sunlight undergoes oxidation. It would appear *a priori* that if such oxidation products do naturally occur, wool-fat would be, above all others, the material in which to find them, and here a possibility at once suggests itself that the indefinite substance isocholesterin may be in some way related to such products.

Physico-chemical relations of Cholesterin in the Tissues: It has already been indicated that with few exceptions, the cholesterin which is a constitutive element of the normal cell and of the tissue fluids occurs in a microscopically invisible form, either in solution or suspension: while as a phenomenon of many pathological processes it appears in a definite crystalline form, which, particularly in the case of fluids, may be obvious to the

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unaided eye, and in the majority of cases the crystals on microscopic examination have the characteristic form of the rhombic plate. Further, it is a matter of common observation that when normal tissues, particularly nervous tissues, have been retained for a long time in alcohol, there gradually separates out from the alcohol a crystalline deposit, which with few recrystallisations from hot alcohol can be shown to be pure cholesterin.

In view of these facts and of the known solubility relations of cholesterin it becomes of considerable interest to determine in what particular associations, if any, cholesterin exists in the cell-protoplasm and in the tissue fluids.

All observers from the earliest are agreed that from such material as nervous tissue or blood, it is possible by simple methods of extraction and fractional recrystallisation to obtain a certain percentage of the cholesterin in a free state, whilst the remainder according to the methods of the older observers, only obtainable after saponification with alcoholic potash, was generally believed to exist in some sort of combination. From tissues containing fat or from fatty secretions—wool-fat, vernix caseosa, dermoid cyst contents—and from blood serum it was found impossible to obtain free cholesterin without saponification, or if possible the amount obtainable was quite a small fraction of the total cholesterin content. In such cases the cholesterin was regarded as existing in combination with fatty acids as esters. Hartmann, and later Schultze, from the investigations of wool-fat, concluded that the cholesterin and the isocholesterin exist in a free state but also and chiefly in ethereal combination with the higher fatty acids and oleic acid, and possibly also with acetic and butyric acids.

Liebreich, using the Liebermann-Burchard reaction and the miscibility with water (" lanolisieren ") as criteria of cholesteryl esters, confirmed these observations, and further found that the esters were associated with keratinised structures, and were not necessarily formed in sebaceous glands, but might be formed within epidermic cells. He ascertained their existence in vernix caseosa, tortoiseshell, horn, whalebone, quills of porcupine and hedgehog, hoof of horse, feathers, etc. Ruppel also regarded the cholesterin of vernix caseosa as being in part in ethereal

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combination with the higher fatty acids, and quite recently Salkowski has isolated from the epidermic scales desquamated from a case of dermatitis exfoliativa, a substance which he regards as cholesteryl palmitate.

Baumstark, who was unable to extract the whole of the cholesterin from brain without saponification, concluded, in view Schultze's observations, that it existed in part as cholesteryl oleate, although he was unable to isolate any body having the properties of the synthetic ester.

From blood, Bordet isolated free cholesterin, and from the serum a substance which he regarded as being of definite composition, and which he termed Serolin; in 1852 Gobley explained this serolin as a mixture of fat, cholesterin and albumen.

It is, however, by the investigations of Hürthle on blood serum that the existence of the ethereal salts of cholesterin and fatty acids in the tissues is almost entirely substantiated. This observer, by fractional crystallisation with alcohol, obtained from the blood serum of the dog, pig, goat, ox and horse, crystalline substances of which, one had all the properties of the synthetic cholesteryl oleate, and another similarly corresponded with the synthetic cholesteryl palmitate. The oleate from different animals curiously gave different melting points, that from the horse and ox 43°C., from the dog 41°C., from the pig 45°C., and, another unusual phenomenon he noted, without comment, was that recrystallisation of the initial crystals led to a progressive lowering of the melting point from 46°C. to 41°C.

Since these observations it has been generally accepted that where cholesterin exists in association with fat and cannot be separated except by saponification it is present in the form of ethereal salts, and Adami and Aschoff, on the basis of the work of Lehmann, have furthered this view by setting up the phenomenon of anisotropism as a criterion for the existence of cholesteryl esters (or cholin oleate). Faust and Tallquist have isolated from the Bothriocephalus latus, and from human gastric mucous membrane, pancreas, and from a carcinoma of the stomach cholesterin which was apparently in ester-like combination. Cholesteryl oleate has been isolated from chylous ascitic

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fluid by Wolff, and from a specimen of the large white kidney by Panzer. The cholesterin in the bile, also according to Aschoff, exists in ethereal combination with fatty acids.

My own observations have not, however, enabled me to confirm the occurrence of the true cholesteryl esters in any of the tissues or fluids investigated, including blood serum (ox).

From nervous tissue (brain) it was possible to extract the whole of the cholesterin in a free state without resort to saponification, a result which has also been attained by Bünz and by Tebb, and which was already suggested by Gamgee. From red blood corpuscles (human), as was already established by Wooldridge, and also from bile (human) cholesterin could similarly be wholly extracted. In these particular cases the cholesterin appeared to be invariably associated with lecithin, but the association, as shown by the method of separation, was probably entirely of a physical kind. From ox-serum—employing the method already described, but with this modification, that after treating the ethereal extract with acetone and filtering, about twice the volume of 97% alcohol was added and the mixture allowed to evaporate spontaneously—there was first obtained a small crop of crystals which on two recrystallisations from hot alcohol had a melting point of 144°C.; three further crops collected had melting points of 109°C., 68°C., and 45°C., after each had been twice recrystallised; the addition of cholesterin to each one at once raised the melting point, and on treating the lowest with sodium carbonate in boiling alcohol crystals were obtained which had a melting point of 118°C., and since the synthetic cholesteryl oleate is not hydrolysed by this procedure, it appeared that in all probability the crystals were mixtures of cholesterin and fat (probably fatty acid) and not true esters. From liver, analogous results were obtained, the ethereal extract yielding a small fraction of free cholesterin and needle-shaped crystals of varying melting point, and which showed very clearly the myelin reaction (lanolisieren of Liebreich) with warm water. Since the work of Hürthle, the occurrence of cholesterin in a free state in the blood serum has also been established by Letsche and by Hepner, but both these observers believe that the remaining cholesterin is in combination with

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fatty acids in the form of esters. From the following pathological products the cholesterin was obtained at once in a free state, gall-stones, atheroma of the aorta, hepatic cirrhosis with visible areas of crystalline material, kindly placed at my disposal by Prof. Lorrain Smith, fluid from a case of hæmorrhagic effusion into the pleura of some duration (described by the late Dr. Harris). In all these cases the cholesterin had assumed a visible crystalline form, and appeared, from the facility with which it was purified to its proper melting point, that it probably existed in a free state.

So far as these observations have proceeded they seem to show that cholesterin exists in the cell protoplasm, in the blood serum, and probably also in fat in physical association with substances which render it miscible with water, and capable of being distributed in an emulsified or even colloidal condition, rather than in chemical combination with fatty acids or other substances.

In addition to the mixtures of cholesterin with fatty acids, soaps and to a less extent neutral fats, which, as already described, have this property, it is a much more pronounced property of mixtures of cholesterin and lecithin. Equal weights of cholesterin and lecithin dissolved in ether or any mutual solvent, give on evaporation of the solvent, a transparent, yellowish, resinous-looking mass which can be rubbed with a little warm water into a creamy emulsion and then further diluted with water until it has the appearance and consistency of milk; such an emulsion or colloidal solution in water I have kept for three months without it showing any disposition to the separation of the cholesterin.

Cholesterin being regarded as a constitutive element of the normal cell, it may be premised that in such it is physically associated with lecithin, the mixture existing in a colloidal condition. In blood serum, in the fat of the liver, and in the fatty secretions of the skin, the cholesterin, which I regard as here being of very different significance, namely, as a product of cell dissolution, becomes associated with fats, fatty acids, and soaps or whatever combination of these is existent, and by them is maintained in a colloidal state to its excretion from the body.

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With this conception of the relations of cholesterin in the normal tissues, the explanation of its appearance in a free crystalline form as a phenomenon of various retrograde pathological processes is at hand. Cholesterin by its chemical inertness is a substance of relatively great stability, while lecithin readily undergoes dissolution; in any retrograde process then which involves the cell protoplasm, the lecithin being readily broken up, the more stable cholesterin unable to maintain its colloidal state, unless there is present fatty acids or their derivatives, assumes a crystalline form. In brief, I would regard the visible cholesterin of pathological processes not as a product of any mysterious and subtle disintegration of the proteid or lecithin molecule, but simply as that which normally was present in an invisible form in the tissues and which, from alteration in its physical environment, has fallen out of solution.

The observations of certain other investigators are, however, in direct contradiction to this view. Carbonne is of opinion that not only fatty acids and neutral fats but cholesterin also originate as products of the decomposition of lecithin, and Waldvogel also claims to have established a similar relation, as is indicated in the following table, which gives the result of the autolysis of lecithin by sterile liver juice:—

Duration of autolysis in days.	Lecithin.	Fatty acids.	Fats.	Cholesterin.
0	11·8	0·52	0·06	0·07
13	6·82	1·80	0·96	1·80
44	1·06	3·74	3·61	5·41

In pathological liver tissue this observer also determined the occurrence of increased quantities of these substances as compared with the normal organ; an extreme example from his analyses is the following, which gives the percentage of these substances in dry liver tissue from a normal organ and from a case of acute poisoning:—

	Fatty acids.	Neutral fats.	Cholesterin.
Normal	1·04	2·44	0·42
Pathological ...	7·73	7·95	24·46

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My own observations on the relation of cholesterin to autolysis, although few, have not afforded results at all comparable with those of Waldvogel, nor, so far as I am aware, has any other observer given them confirmation.

I. 600 grammes of normal human liver, which by control extractions was found to contain 0·038 % of cholesterin, was allowed to undergo aseptic autolysis (toluol method) for 42 days at 37°C., at the end of this period an estimation of the cholesterin content gave 0·0372 %.

2. Estimations of the cholesterin content of the spleen pulp (human) and of necrosed spleen pulp from the same organ (a large ischæmic infarct) gave practically the same percentage in the normal and the morbid :—

Spleen pulp, 0·64 %. Infarct, 0·58 %.

Results which would seem to indicate that the disintegration of cell protoplasm is not associated with any increase in the absolute cholesterin content, as is maintained by Carbonne and Waldvogel. The seeming abundance of the crystalline cholesterin in certain pathological products, which in itself might suggest a new formation of cholesterin, is generally more apparent than real—thus in the specimen of pleural fluid in which the cholesterin crystals were so abundant as to give it the appearance of " silver paint," the actual percentage found was 0·052, which is somewhat less than that of normal blood—and even in such cases as where there is an actual increase in the cholesterin content over and above the normal, this may be readily explained by the removal of other products of cell dissolution and a concentration of the cholesterin. The existence of cholesterin as a constituent of keratinoid substances would appear to be in accordance with this view, it remaining unchanged and perhaps relatively increased in amount with the process of keratinisation.

On such grounds, I believe, cholesterin may be regarded as a constitutive element of the normal cell, and of such stability that it not uncommonly remains as a visible indication of previous cell dissolution.

The mode of origin, the fate and the significance of cholesterin in the animal cell : These problems, which have been the subject of diverse hypotheses generated under the influence of a doctrine which modern research is proving to be ill-founded and

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erroneous, namely, that whereas synthetic phenomena are essential characteristics of vegetable protoplasm, destructive phenomena are the dominant features of the animal cell, and with cholesterin as with other complex constituents of the animal organism, the origin has been sought, either in some retrograde change of apparently still more complex bodies, or in the direct transference of the substance from the vegetable to the animal cell. Both these views have been expressed in explanation of the occurrence of cholesterin in the animal cell, the former propounded by Hoppe-Seyler is generally accepted, and regards cholesterin as a cleavage product constantly formed in the metabolic changes of the living cell, and accordingly an invariable constituent of both of the animal and vegetable cell. Such a hypothesis, acceptable in the absence of any knowledge of the general occurrence of synthetic processes in the animal cell, is contrary to such knowledge as we possess of the constitution of the products of proteid, fat or carbohydrate dissolution, and it is difficult to reconcile with what we know of the metabolites in general.

That the cholesterin of the animal cell is entirely derived from that taken into the organism with vegetable food has been seriously advanced, but is quite unsupported by any known facts.

As the synthetic capabilities of the animal cell become more definitely established a substance of the constitutional relations of cholesterin, which in the animal organism occupies a class alone, with perhaps inosite as its nearest analogue, is more easily conceivable as a product of such processes than of the disintegration of any other known constituent.

Cholesterin is continually being lost to the organism, and it would appear that this is in immediate sequential relation to cell dissolution. It has already been premised that the liberation of cholesterin which occurs in pathological cytolysis is not uncommonly associated with the deposition of cholesterin *in situ* in a crystalline form, when its resistance to disintegratory processes becomes manifest by its persistence for long periods, and further, in those situations where the retrograde processes which gave the cholesterin liberty are succeeded by reactive reparative phenomena, by the not unusual feature of the

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cholesterin crystals being invested by giant cells, showing that the organism is dealing with them as it would with any inert resisting body.

Under physiological conditions the processes of cell dissolution are, I believe, equally with the pathological, associated with the liberation of cholesterin, and yet it rarely, if ever, assumes the crystalline form, but continues to retain its colloidal state either as a result of the non-involvement of the lecithin in the disintegratory process or, what appears more probable, of its becoming associated with neutral fats, fatty acids, and may be soaps, which themselves may, wholly or in part, be products of the splitting of the lecithin molecule, and in such combination it is excreted from the organism. On the surface of the body where cell dissolution of a particular type—keratinisation—is a continuous process, cholesterin associated with the fatty secretions of the sebaceous glands is a prominent constituent of the oily secretions of the skin, and that its origin is from the desquamated cuticular layers rather than from the sebaceous glands themselves is shown by the researches of Liebreich. From mucous membranes where the phenomenon of cell dissolution also occurs, but to a less degree, cholesterin, as shown by its presence in the bronchial secretion, is a constant but insignificant constituent, and doubtless also from the gastro-intestinal and other mucous membranes cholesterin will occur in amount proportional to the degree of cell dissolution.

It is, however, the fate of the cholesterin liberated within the organism, in the normal cytolytic processes, that calls for consideration. While it is possible that cytolysis is, in some measure, a physiological phenomenon of every tissue of the organism, continuous dissolution with continuous regeneration is a striking feature of the life history of the red blood corpuscle, an element which, next to the nervous tissue, is richest in cholesterin. The fate of the cholesterin liberated in this process is recondite, but in the absence of any evidence to the contrary it may be regarded as constituting the cholesterin of the blood plasma, where it has become associated with fatty acids and their derivatives, and, may be, in part, also still retains its association with lecithin. The abnormally large amounts of cholesterin

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which have been shown to exist in the blood plasma in certain severe types of diabetes mellitus (Fischer and others) is perhaps an expression of rapid cell dissolution which is a phenomenon of this morbid state.

The ultimate destiny of this cholesterin, no longer a protoplasmic constituent, would seem to be that it is excreted by the liver, although this view of the origin of the bile cholesterin has been largely overshadowed by the dominant views of Naunyn that this latter is almost exclusively of mucous membrane origin.

In the bile, cholesterin, it would appear from my own analyses of human bile from a gall-bladder fistula, is still associated with lecithin, and held in a colloidal state by that substance, aided by the sodium salts of fatty acids, the bile acids in particular; an association which, from the observations of Gérard, may be destroyed by bacterial activity and lead to the deposition of cholesterin in a crystalline form.

Excreted with the bile into the intestine, cholesterin may be resorbed in combination with fatty substances to some small extent, but from direct experimentation (Naunyn, Thomas) there is no evidence to regard it as a significant phenomenon, and, together with that derived from the dissolution of the cells of the gastro-intestinal mucous membrane, it is excreted from the body with the fæces, in which, according to the investigations of Bondzynski and Müller, it may have undergone an apparent reduction.

In this connection it is interesting to record that the extraction of 100 grammes of dry fæces from an individual in whom there was complete stenosis of the common bile duct, failed to yield either cholesterin or coprosterin in sufficient quantity to enable me to recognise them.

Summary:—As a constituent of the living cell and as a product of its synthetic activity, cholesterin, associated with lecithin in a colloidal state, may be regarded as constituting—as its characteristic inertness would lead one to premise—in part, at least, that relatively stable structural protoplasmic reticulum—the spongioplasm—in the meshes of which is contained the labile hyaloplasm. Such is the hypothesis which the results of my own investigations appear to suggest, and such appears to more

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closely accord with the diverse facts as have been established by the work of others. With the dissolution of the cell—normal or morbid—the cholesterin, the least destructible of the several constituents, liberated from such physical association as maintained it in colloid state, either assumes a crystalline form, or, acquiring new association with fatty acids and their derivatives (glyceryl esters—salts), is still maintained in a colloidal state, and, being conveyed to the liver, is excreted thence into the bile and so from the organism. Much investigation may be necessary to the completion of this roughly-drafted hypothesis, but it is in this direction, I believe, that the solution of the problems of the origin and significance of cholesterin is to be sought.

The rôle of cholesterin in the cell:—The peculiar stability of cholesterin would appear to preclude it from any significant part in the complex of chemical changes which characterise living protoplasm, but there are many indications that this substance may, in virtue of its physical properties, and particularly that which may be designated its adsorptive power, have a very profound significance for the cell economy.

The peculiar relations which obtain between cholesterin and water, alcohol, and the fatty acids, in particular, which have already been considered, appear to be analogous to its relations to certain other substances.

In a series of investigations on the physico-chemical basis of plasmolysis and intravital staining, Overton determined that those substances which are able to penetrate into the living cell have in common the property of being fat soluble, and of being soluble in cholesterin, lecithin, and also in such other lipoids as cerebrin and protagon, whilst those substances which are unable to penetrate the living cell except in some indirect manner have not this property. Overton accordingly formulated the hypothesis that cholesterin, lecithin, and other similar lipoids are essential constituents of the cell protoplasm, varying physically and possibly chemically within certain limits with different orders of cells, and that these lipoids constitute by peripheral concentration a semi-permeable membrane investing the cell. According to this observer the substances which diffuse into and out of the cell most rapidly are the monohydric alcohols,

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aldehydes, ketones, aldoximes, ketoximes, mono- di- and trihalogen derivatives of the hydro-carbons, nitro-alkyls, alkyl cyanides, the neutral esters of inorganic and many organic acids, aniline, etc.; those which possess this property to a less extent are the dihydric alcohols, and the amido compounds of the monocarboxylic acids; to a still less extent, glycerine, urea, thiourea, and erythritol; and to a scarcely perceptible degree, the hexahydric alcohols, the hexoses, amidoacids and the neutral salts of inorganic acids.

Those aniline dyes which possess the property of intravital stains—neutral red, methylene blue, toluidine blue, nile blue, safranin,—are lipoid soluble, whilst other dyes which do not possess this property have not this particular solubility relation.

It is interesting to note that with intravital staining, the cell protoplasm is not uniformly coloured, but that certain granules, which, according to Höber correspond with the " granula " of Altmann, are stained most intensely and would thus appear to have a lipoid constitution; as cholesterin is a probable constituent this phenomenon affords some support for the hypothesis previously formulated.

Whether Overton's conception of the lipoid cell membrane be accepted or not, it must be conceded that this observer has accumulated a large amount of evidence to show that the living cell will take up either by osmosis or adsorption substances which *in vitro* are soluble in (or adsorbable by) cholesterin, lecithin and other less definitely constituted lipoids.

In the phenomenon of hæmolysis which has attracted considerable attention during recent years, cholesterin appears to play a significant rôle, and in a fashion analogous to that which it sustains in the preceding phenomena.

In 1901 Ransom, investigating the mode of action of saponin on blood, found that red corpuscles washed entirely free from blood serum were much more susceptible to the hæmolytic action of saponin than were those with which serum was still associated; and he found that the constituent of the serum which interfered with the hæmolytic action of the saponin was contained in its ethereal extract and was cholesterin, lecithin, which also combined with the saponin, having no effect on its toxicity for the red

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corpuscles. He concluded that the toxic action of saponin depended on the affinity or solubility relation which obtained between this substance and the cholesterin-lecithin constituent of the cell, and, further, that the existence of extra-cellular cholesterin might, within certain limits, be a means of defence against the toxic action of saponin and members of the saponin group, but not against such other hæmolysins of vegetable origin as phallin and crotin nor against hæmolytic alien sera, on which he found cholesterin to be without effect. Noguchi further established that cholesterin is capable of neutralising the hæmolytic action of agaricin, saponin, and tetanolysin, and that lecithin has no such effect.

Flexner and Noguchi, working with cobra venom, found that red corpuscles washed free from blood serum were agglutinated by this venom, but only in the presence of blood serum did they undergo dissolution, from which they concluded that the venom-hæmolysin is of the nature of an amboceptor (or perhaps more accurately an amboceptor-complement complex) which is activated by some substance in the blood serum.

Kyes, confirming these observations, succeeded in showing that lecithin is the activating substance for the amboceptor of cobra venom, and he regarded the combination of lecithin with cobra venom as being of a chemical nature, as he was able to prepare and isolate the lecithade of cobra venom and also of other venoms.

In certain species it was found that the red corpuscles, even after being washed free of serum were dissolved by cobra venom, and in such, according to Kyes and Sachs, the cobra venom amboceptor is activated by the lecithin of the corpuscle itself, which accordingly must be more loosely combined than in those corpuscles which are resistant when washed free from serum.

Koeppe, Peskind, Van de Velde and others have pointed out that the hæmolytic activity of such substances as chloroform, ether, bile salts, amyl alcohol, etc., probably depends on their being solvents of cholesterin and lecithin.

Pascucci, employing silk membranes permeated with mixtures of cholesterin and lecithin in proportions varying from 1 : 1 to 5 : 1, found these were rendered permeable to solutions of

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hæmoglobin and cochineal in normal saline, by such hæmolytic substances as saponin, solanin, cobra venom, tetanus toxin, and the more rapidly the less cholesterin they contained. He further confirmed that the addition of lecithin to the hæmolysins had no effect, whilst the addition of cholesterin sufficed to neutralise their activity; and he suggested that the varying resistance of washed red corpuscles to cobra venom might be explained by the varying quantitative relations of lecithin and cholesterin in the corpuscles.

Madsen and Noguchi, investigating the degree of dissociation of the cholesterin + saponin combination by measuring the hæmolytic activity of various cholesterin + saponin mixtures, found that the formula representing the diphtheria toxin + antitoxin mixtures agreed most closely with the observed values—

$$\frac{1}{T_0}\left[N\frac{1}{T}p-\left(\frac{1}{T}-\frac{1}{T_0}\right)\right]=K_1\left(\frac{1}{T}-\frac{1}{T_0}\right)^{\frac{2}{3}}$$

Where T = hæmolytic activity, N = quantity of cholesterin, $\frac{1}{p}$ = equivalent number of cholesterin to saponin.

On evaporating to dryness a cholesterin + saponin mixture inactive to blood, they obtained a pulverisable mass which frothed into solution on the addition of water. But as the cholesterin could readily be isolated by chloroform they observed that the combination must be a very loose one.

In these several phenomena in which cholesterin is concerned, the manner of its action has yet to be explained. It may be premised that cholesterin acts purely physically as by adsorption a property which it possesses in a high degree, or its action may on the other hand be of a chemical nature, as Ransom and others suggest.

With the view of elucidating this problem Abderhalden and Le Count have examined, comparatively, the effect of cholesterin from various sources and of a large series of its derivatives on the hæmolytic activity of cobra venom, tetanus toxin, saponin, solanin and vibriolysin. Early in their investigations, from the results obtained with a limited number of cholesterin derivatives and a few hæmolytic substances, the conclusion appeared inevitable that the action of cholesterin depended on the integrity of its hydroxyl group and to less extent on the integrity of its

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unsaturated condition; but the results of more extensive experiments showed that such definite conclusions were premature. Hausmann, with a similar object in view examined the comparative effects of a large series of cholesterin derivatives in the hæmolytic activity of saponin, and concluded from the results obtained that the antitoxic action of cholesterin was abolished by substitution of the hydroxyl group, and that it was weakened, although not abolished, by the saturation of the molecule.

Conclusions identical with those which Abderhalden and Le Count had by further investigation been caused to seriously modify.

It would thus appear from the results of such investigations as have been concerned, immediately or remotely, with cholesterin as a cell constituent, that this substance may be of fundamental importance in the physico-chemical processes of the cell, exerting a profound influence on the ingress and egress of substances which have particular solubility relations, either in virtue of its adsorptive power or in some other as yet more recondite manner which may be associated with some special features of its molecular constitution.

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THE MEDICAL CHRONICLE.
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SOME PHASES OF TREATMENT BY SERUM.

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THE treatment of disease in man by the administration of the normal or abnormal blood serum of other animals, whilst still a problem of great complexity from the purely scientific side, may be considered clinically as consisting of two questions—firstly, has the treatment the good results that are claimed for it? secondly, is it capable of doing harm?

The first question I do not propose to discuss. In the case of diphtheria it is already decided by overwhelming evidence; in certain cases of septicæmia it has many times seemed to experienced observers that life has been saved by the use of serum. In some other diseases the balance of evidence certainly appears to be in favour of this method. In order, however, to obtain favourable results clinically, it is necessary to remember that sera do not all depend on the same property for their action. The practical application of this is that it must be regarded as of little use to give a serum such as diphtheritic antitoxic serum, which only neutralises the toxin present in the body and has no power to check the growth of the diphtheria bacillus, to cases in which the toxin has been at work for many days and at a time when the local lesion has already begun to cease producing toxins. The great curative power of antitoxic serum lies in its capacity to neutralise circulating toxin, and whilst saving the tissues from the destructive agency, leaves them free and sufficiently healthy to carry out the protective process against the bacterial attack. It is obvious that to be effective such a serum must be given as early as possible. On the other hand, bactericidal sera, such as that described as antistreptococcic, may be given with hope of success so long as there is reason to believe that the specific micro-organisms are free in the tissues

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and that no irretrievable damage is established. If this treatment is adopted in septicæmia it should be energetic, as described by Dr. Knyvett Gordon and others, large doses such as 50 c.c. or more being used. The most satisfactory method of administration is by subcutaneous injection. Intravenous injection may perhaps in some severe cases give better results, but it is not simple enough for routine work. It has, however, been shewn by J. H. Smith that the antitoxin acts immediately in full strength after intravenous injection, but after subcutaneous injection the maximum effect, as judged from the blood content, is not attained till the third day, though an appreciable quantity is present in twelve hours. The results of giving serum by the mouth or by the rectum are very uncertain. Diphtheritic antitoxin serum retains its power for several years but most sera are useless when more than six months old.

Turning to the question of possible danger in serum treatment, it may be emphatically stated that the risk from a single injection is negligible. It does indeed seem probable that an idiosyncrasy exists in a very small proportion of the population, and a number of cases have been reported in which severe symptoms have occurred. Death has been ascribed to it in a few instances. Remembering, however, the readiness that exists to attribute an unexpected death to some known but perhaps unusual agent, and remembering the obscurity that many times attends fatalities in diphtheria where there has been no use of serum, we must be cautious in accepting any but well evidenced cases. Moreover, in more than one case where an examination has been made post-mortem an enlarged thymus, well recognised as not infrequent in obscure cases of sudden death, has been found. The space given here to the mention of these cases greatly exceeds in proportion their importance in the serum treatment. In the words of W. P. Herringham, "it is well, however, to quote these instances in order that, if they are the results of antitoxin, which is very doubtful, they may be supported by others."

It must be reiterated that, even accepting them, these cases are exceedingly rare, and not to be thought of as a reason for even hesitating to use serum therapeutically. The writer has given serum in doses varying from $\frac{1}{2}$ c.c. to 100 c.c. to over 500 cases, and has watched at least another 500 cases in which it has been used, and in no instance has there been even a

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momentary anxiety from the serum reaction after a first injection. Immediately after the injection the patient frequently falls asleep and temporary polyuria may follow. The well-known "reaction" usually occurs between the fifth and eleventh days, but may be either earlier or later. The proportion of cases affected varies very greatly, probably with the serum used, and, to a lesser extent, with the bulk injected. In my own experience the percentage of cases giving the reaction has varied from twenty to sixty. It must be remembered that a rash may be of such short duration as to escape observation except by chance. The rash appears, then, probably between the fifth and eleventh days, and may last from an hour or less to two days or more. It may be erythematous, urticarial, scarlatiniform or morbilliform; it may change from one type to another. There is often much itching. The rash is chiefly seen on the trunk, and especially on the abdomen when that has been the site of injection. The temperature often rises a little, and may reach 102°. There is rarely any appearance of corresponding malaise. The most troublesome phenomenon is the less common one of swelling and pains in the joints. This may be severe, but does not persist long in any one side, though it may in turn involve nearly every joint in the body. It is, however, now rare in my experience, and has never caused more than temporary inconvenience. Adults are more affected than children. Albuminuria and paralysis have been attributed to the anti-diphtheritic serum, but probably with no other foundation than the survival of cases which untreated would have died, but later showed the ordinary complications of the disease.

The immediate local reaction at the site of injection is not often worthy of note.

The discussion of serum treatment raises the interesting question whether the unwelcome reaction may not be avoided. It is of course known that it is not the curative part of the serum which is at fault, and there seems every reason to believe that before long the reaction described above will be unknown to the clinician. A great improvement has certainly taken place in the last four years.

It has been suggested that as urticaria is associated with decreased coagulability of the blood, and as urticaria occurs in the serum reaction, calcium lactate or some other salt increasing coagulability should be given with a view to avoiding the

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reaction after the injection of serum. Whether this be good or not in other cases I myself think it bad treatment in diphtheria. It ignores the fact pointed out by Baginsky that the coagulability of the blood in diphtheria is increased. He states that the condition is so marked that thrombi may form and cause cardiac embarrassment. The fact as to the blood is indeed evident to anyone taking a series of blood specimens from diphtheria patients, and I had noted it and thought it the cause of circulatory disturbance before reading the account of Baginsky's views. I had, therefore, been in the habit of giving citrates to diphtheria patients with a view to decreasing the coagulability of the blood. The results seemed good, and I did not observe any increased serum reactions. In the face of this I cannot believe it to be good treatment to give calcium salts with such a small gain in view.

Having said that the effects of a single injection of serum need not cause any anxiety, it remains to mention the effect of repeated doses. This, both from the clinical and the laboratory aspects, is a different matter. In some animals the injection of one dose of serum produces in about ten days an extreme susceptibility of long duration to further injections. There is sufficient evidence to prove that this phenomenon is exhibited in human beings, though to a smaller extent.

The reaction after a second injection may follow very rapidly. I have seen it occur within an hour. Accompanying the appearance of the rash there may be marked distress and restlessness. Of course, in the great majority of cases, certainly in over 95 per cent., nothing causing any anxiety is seen; but it is well to remember the possibly rapid onset, with the association obvious to all observers, and to mention beforehand the chance of it. A case has been recorded in which the increased susceptibility lasted over four years. The pathology is not yet worked out.

I should say that almost the whole of my clinical experience of serum treatment has been from cases at Monsall Hospital, and I am indebted to the Medical Superintendent, Dr. Knyvett Gordon, for permission to quote from those cases.

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CHRONICLE.

Medicine.

Early Recognition and Treatment of Pneumonia in Infants and Young Children.

NORTHRUP (W. P.). *New York Med. Journal,* July, 1907.

PNEUMONIA is a toxæmia with a sudden onset of fever, prostration and disturbed pulse-respiration ratio; the lungs may at the onset show no physical signs. The development of the fever is abrupt, and often with the administration of a purgative shows a temporary decline, soon afterwards again reaching its former level; this feature Northrup considers a useful aid in early diagnosis. The prostration is that of a child who has been drugged. The earliest physical signs in the lungs are a diminished respiratory murmur over a limited area, and small patches of bronchial breathing. The diseases which are most easily confounded with pneumonia are meningitis, otitis media, enterocolitis, and in older children typhoid fever. Prognosis is good in primary, variable in secondary pneumonias. Treatment requires efficient ventilation, good light, absolute cleanliness, especially of the mouth and nose, free purgation in the early stages, preferably by means of calomel or castor oil. With regard to the diet Northrup recommends "courageous starvation," and concludes by saying that he believes the time is near at hand when the pneumonia of infants and young children will be treated mainly by fresh cool air, water inside and outside the body, and careful feeding.

The Climate of New Mexico, Nature's Sanatorium for Consumptives.

CARRINGTON (P. M.). *New York Med. Journ.,* July 6, 1907.

THIS is an elaborate resumé of the conditions of temperature, moisture, rainfall, velocity of winds, occurrence of fogs, etc., at the various sanatoria in New Mexico. The climate throughout this vast region appears to be well suited to the needs of consumptives, its chief drawback being the occurrence in many places of high winds. Many of the sanatoria, however, mentioned by Dr. Carrington seem to be free from this objection.

Note on the Mortality of Diphtheria in the Canton Vaud and at the Cantonal Hospital at Lausanne from 1889-1907.

MORAX (J.). *Rev. Méd. de la Suisse Romande,* July 20, 1907.

THE opponents of the use of antitoxin in diphtheria are always

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so active that it seems worth while to draw attention to the remarkable figures contained in this article, from which we quote a part of the resumé. 1895 was the year of the introduction of antitoxin :—

The mortality from diphtheria	1889—1894	1895—1906
In the Canton Vaud was	51·3% ...	9·3%
At the Cantonal Hospital was	41·4% ...	6·7%

H. THURSFIELD.

Abdominal Pains and Pains in Ileus.

LENNANDER (K. G.). *Hygiea*, 1907, p. 657.

ABDOMINAL organs innervated only by the vagus or sympathetic cannot give rise to painful sensations; only those innervated by the phrenics or by the 6 lower intercostal, the lumbar or the sacral nerves can do so. The parietal peritoneum on the anterior abdominal wall can give rise to feelings of pain, but is insensitive to pressure, cold, or heat, in this peculiarity resembling the cornea. Lennander believes that all abdominal pains are felt through the parietal peritoneum and its subperitoneal tissue, which are richly supplied with cerebro-spinal nerves, with the possible exception of an area, in front of the vertebral column below the crura of the diaphragm and between the two sympathetic trunks, which appeared (in two cases) to be insensitive. The great causes of abdominal pain are stretching or shifting of the peritoneum over the underlying tissues, or traction on the origin of the mesentery or on mesenteric adhesions. The parietal peritoneum round the edge of the thorax and about the foramen of Winslow is particularly sensitive to such stretching or shifting. Infection of the abdominal cavity gives rise to lymphangitis and lymphadenitis, and these greatly augment the sensitiveness of the parietal peritoneum and the subperitoneal tissue; the large extent of subperitoneal tissue commonly affected thus explains why the pain is often felt over the whole abdomen, although the extent of the peritonitis actually present may be small. The generalised pains are also due in part to the increased peristalsis, which may give rise to nausea, vomiting, diarrhœa, and occasions increased pressure on the parietal peritoneum and traction on the mesentery. The pain lessens when the intestine becomes paretic, or a copious exudation takes place, or the inflammatory process more or less destroys the nerve-endings in the parietal peritoneum; a very small amount of peritonitis can cause a great increase in the sensitiveness of the parietal peritoneum.

The pains felt on the perforation of *e.g.* a gastric ulcer, is due to irritation of the parietal serosa by the escaping gastric contents, and then to the increased peristalsis occasioned thereby. Lennander thinks Nothnagel's view that colic is due to sensa-

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tions transmitted from the intestine is erroneous; the intestine is insensitive to pain, and extreme tonic contraction or anæmia of the intestine can be produced (by electrical stimulation) without the knowledge of the patient. Pain is only felt in colic when the mesentery is drawn upon; and this happens when, e.g., intestinal obstruction is present and the intestine above the obstruction contracts. The contracting intestine endeavours to form a straight cylinder, and its mesentery attachment prevents it from so doing; hence the mesentery is pulled upon and pain is felt. This is Wilms' view, and it is suported by Lennander. Lateral displacement of the parietal peritoneum is similarly painful; such displacement occurs probably whenever the intestine contracts down on its contents and presses itself as a hard mass against the parietal peritoneum; of peristalsis as such we have no knowledge. Lennander has not very often found an area of cutaneous hyperaesthesia in acute inflammatory abdominal affections; he would at once not adopt Head's explanation of its occurence, but thinks that it may be due to subperitoneal infective lymphangitis.

The liver, gall-bladder, and the extra-peritoneal bile-ducts are not sensitive to pain themselves; the pain in biliary colic is due to traction on the sensitive subperitoneal tissue round the bile-ducts; spasm of the gall-bladder is not *per se* painful, but gives rise to pain by mechanically drawing on the retroperitoneal tissue round the bile-duct.

A. J. Jex-Blake.

A case of Bilateral Malignant Suprarenal Tumour.

De Besche (A.). *Norsk Mag. f. Laegevidenskaben*, 1907, p. 981.

The author first discusses the history of the complex and obscure tumours that arise from the suprarenal bodies; the tumours have been variously described as carcinomas, sarcomas, angio-sarcomas, endotheliomas, mixed carcinomas and sarcomas, and hypernephromas: " malignant adrenal tumours " serving as a non-committal title. De Besche's patient, a previously healthy woman of 68, was weak and ill for about five weeks before her death, complaining of wasting, loss of appetite, abdominal pains independent of food, vomiting without hæmatemesis, insomnia, and swelling of the legs. She was extremely emaciated, free from fever, and had a tender mass in the epigastrium and another to the right of the umbilicus. At the obduction the stomach was found to be dilated, and there was an ulcerated adeno-carcinoma at the pylorus; the lymph-glands in the smaller omentum were secondarily affected. The intestine, pancreas, liver, spleen, and internal genitalia were normal. The kidneys were a little granular, smallish, free from new

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growth. The suprarenals were replaced by new growths, and these did not adhere to or infiltrate the adjoining tissues or each other where they met in the middle line. The right tumour was irregularly rounded, the size of an apple, invested with a capsule 2 mm. thick, soft; on section it was gray, yellow, or hæmorrhagic. The left tumour was of the same size, softer, and on section yellow at the edges, then gray, and broken down to a dark hæmorrhagic fluid at the centre. In neither tumour could any normal suprarenal tissue be found. In the 4th and 5th left ribs and in the sternum were half a dozen soft secondary deposits, on section gray or red with a few small yellow spots.

Microscopically the two suprarenal tumours were identical. They showed much necrosis, hæmorrhagic infiltration, and degeneration. They contained a good deal of fine fibrous tissue and distended capillaries or mere blood-spaces, with irregularly arranged tumour cells of very variable size and shape lying in between. These cells were up to 200 μ in diameter; the larger cells had many nuclei; occasionally the smaller cells were arranged in columns or alveoli, and they seemed to be most plentiful just around the vessels; in places the vessels contained tumour cells mixed with red blood-corpuscles. Yellow pigment, both free and in small round cells, was found freely, particularly in the neighbourhood of hæmorrhages, and it gave the Fe reactions of Perl and of Quincke. Many of the tumour cells contained fat; glycogen was not found, nor were elastic fibres or chromaffin substance. No normal suprarenal tissue could be found under the microscope. The metastatic nodules in the bones were microscopically similar to the primary growths described above. De Besche thinks that the pyloric tumour was quite independent of the two suprarenal new growths; he remarks on the absence of any bronzing of the skin in his case.

A. J. Jex-Blake.

On Acute Poisoning with Sublimate and Oxalic Acid.

Pfeiffer (W.). *Deutsches Arch. f. klin. Med.*, 1907, 90, p. 591.

A man of 20 took about a teaspoonful of corrosive sublimate (fatal dose 0·18 gramme) dissolved in water, and fell crying to the ground. He was given warm milk to drink, and vomited; in an hour he was admitted to the hospital complaining of salivation, a burning and metallic taste in the mouth, thirst, and cramps in the legs (from which he had often suffered before). He vomited 20 c.cm. of yellow alkaline fluid free from milk, and then his stomach was washed out with $3\frac{1}{2}$ litres of milk. For the first two days he passed much pale urine containing 0·1 per cent. of albumin and no sugar; on the next eight days respectively he passed 6, 15, 41, 32, 108, 100, 290 and 700 c.cm. of urine,

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and after that polyuria again occurred. The albumen was up to 0·175 per cent. Stomatitis and glossitis were observed on the third day; diarrhœa did not occur, but the patient was constipated. Œdema was not seen; the temperature was normal or subnormal; after a month the patient was discharged cured. Pfeiffer found the excretion of Ca in the urine much increased on the 1st day, the 13th—16th days and the 24th day; the Mg excretion was not augmented.

A boy of 15 took 0·75 gramme of corrosive sublimate on an empty stomach. For three days he vomited blood-stained fluid, and had much diarrhœa (without melæna); the urine from the outset was scanty, and contained blood, and after the second day did not exceed 3 c.cm. per diem. The patient died on the 7th day; at the obduction there was marked hæmorrhagic inflammation of the lower part of the small intestine and of the whole of the large intestine, with extensive necrosis of the mucous membrane. The kidneys showed violent parenchymatous inflammation and fatty degeneration, and were much swollen.

The third patient, a man of 45, took about 19 grammes of salts of sorrel dissolved in water. Vomiting and diarrhœa soon set in; three hours later he was given milk and soapy water to drink, and vomited copiously. An hour after this he was brought to the hospital, and his stomach was washed out with lime-water. After this he vomited blood-stained material, and diarrhœa, without melæna, continued. The temperature was raised for two days; œdema was not observed. The urine passed on the seven succeeding days measured 20, 120, 93, 225, 580, and 670 c.cm., and contained 1·5 per cent. albumin at first, but latterly only 0·05 per cent., and was practically normal after 12 days. Oxalate crystals were only very sparingly found in the urine. The patient went out cured in 19 days.

A. J. Jex-Blake.

Perforation of Aortic Aneurysm into the Pulmonary Artery.

Kappis (M.). *Deutsches Arch. f. klin. Med.*, 1907, 90, p. 506.

The author details the case of a man of 44, who had never taken alcohol in excess or had venereal disease, and who had suffered from transient attacks of faintness for several years, who came into hospital for heart-failure. On examination (Jan. 30), he was a strongly-built man, cyanotic, short of breath, anasarcous, and with bronchitis and a much hypertrophied and dilated heart. The pulmonary second sound was not accentuated, and a rushing systolic murmur, loudest at the apex, was audible over the præcordia. The patient made no improvement for six weeks; at times an aortic diastolic murmur appeared, and a diagnosis of aortic and mitral reflux was made. At the end of February a new

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murmur appeared in the 2nd and 3rd left intercostal spaces, loud during systole, softer during diastole, and continuous throughout both; the double aortic murmur persisted; no thrill was palpable at the base; at the apex was a systolic thrill, a loud systolic murmur, and a faint diastolic murmur. The man improved much after the middle of March, taking digitalis and diuretics; an area of dulness, previously absent, was noted beneath the left upper part of the sternum, extending out two inches into the 2nd left intercostal space. The additional diagnosis of a patent ductus Botalli was made; the patient went out much improved at the end of May, but died with anasarca and dyspnœa in July. At the autopsy, hypertrophy and dilatation of all the chambers of the heart was found, with a sacculated aneurysm of the ascending aorta $2\frac{1}{4}$ inches high, up to 7 inches in circumference, causing stenosis of the pulmonary artery, and communicating with it by a round hole $\frac{1}{4}$ inch across with smooth endothelium-covered edges. The aortic and mitral valves were relatively insufficient, the pulmonary and tricuspid were not so. The ductus Botalli was closed.

Kappis discusses the details of this case at some length. He also gives a careful summary of the literature, tabulating the details of 32 similar cases under 10 headings. For the purpose of diagnosis he would lay weight on—(1) the sudden onset of severe cardiac symptoms; (2) demonstration of the presence of an aortic aneurysm; (3) the presence of a cardiac murmur at the base on the left side, which should, characteristically, be continuous throughout systole and diastole. Fifty references to the literature are given.

A. J. Jex-Blake.

Abortive Forms of Tabes.

Raymond (F.). *Medical Press,* Sept. 4, 1907.

The polymorphism of tabes dorsalis, especially in the pre-ataxic stage, is well recognised, yet it is doubtful if cases of any other form of disease are so frequently wrongly diagnosed.

The first case reported by Raymond, a woman of 37, complained only of sudden attacks of numbness limited to one side of the body, with transient blurring of consciousness but without convulsive phenomena. On examination, there was found slight ataxia of the limbs, unsteadiness in standing with the eyes closed, loss of the pupillary reactions to light, as well as absence of the knee- and ankle-jerks and diminution of the reflexes of the upper limbs. Such signs indicate tabes; the sensory seizures (sensory Jacksonian epilepsy) occurring in tabetics generally point to meningo-encephalitic lesions such as are found in general paralysis. In this case this diagnosis was further suggested by tremor of the tongue and slurring of articulation.

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The second case, a man aged 39, had had for eight years recurring painless ulceration of the soles of his feet. These were typical perforating ulcers; they were quite anæsthetic and they extended down to the bones, but there was no inflammatory reaction round them. At 21 he had syphilis. From 25 he had for a few years shooting pains in his legs and since then a girdle sensation.

On examination the knee-jerks were found present but diminished, the pupils were inactive to light, the limbs were hypotonic, and there was difficulty in starting micturition and occasionally incontinence.

In the third case the only symptoms for five years were radiating pains in the legs, which came on in attacks lasting about about half an hour, and attacks of vomiting which occurred without any relation to meal time. The vomiting was at first painless but later was associated with a constrictive girdle sensation. The only physical signs of tabes were absence of the pupillary reflexes to light and diminution of the knee-jerks.

According to Raymond gastric crises may be modified by the co-existence of chronic dyspepsia or by gastritis due to medicinal treatment, especially, as in this case, to morphia. Then the typical crisis form of the vomiting may be absent. The treatment recommended is abstinence from morphia and the subcutaneous injection of nitrate of soda in increasing doses, beginning with one cc. of a 2 per cent. solution daily and increasing it gradually till 4 ccs. are given each day.

GORDON HOLMES.

The Classification of Psychoneurotics, and the Obsessional Element in their symptoms.

WALTON (G. L.). *Journ. Nerv. and Ment. Diseases.*, Vol. 34, p. 489, 1907.

THE classification of the psychoneurotic affections is unsatisfactory and often misleading. Many cases have symptoms of all the recognised classes, and the majority of these are found on analysis to be but variations of a common tendency. It is thus advisable to classify cases only under general term, as psychoneurosis, or obsessive psychosis.

The author insists on the obsessive tendency in all the psychoses; according to him all sufferers from these various forms of mental disorders are ideo-obsessive. The *spasmodic tics* originate in a compelling impulse; *folie du doute* results from the obsession to satisfy the doubt and an overscrupulous insistence on choosing the right step; *hypochondria* from the obsession to be well, to have every sensation correspond to an ideal; the *phobias* are merely obsessions to be perfectly safe,

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comfortable and well; and the majority of the cases of *neurasthenia,* even when apparently due to the stress of overwork, arise from the same cause, as it is often to an ill-directed mental activity which insists on unnecessary attention to the details of business, that they are primarily due.

As this obsessive tendency is the basis of all these conditions rational treatment must be directed to combating it.

Myoclonus-Epilepsy, with a report of two cases.

SHANAHAN (W. T.). *Journ. Nerv. and Ment. Diseases,* Vol. 34, p. 504, 1907

Remarks on Myoclonus-Epilepsy, with report of a case.

PIERCE CLARK (L.). *Ibid,* p. 524.

THIS condition is characterised by the presence in an epileptic of sudden shock-like contractions of symmetrical muscles of the limbs, trunk and face, occurring in paroxysms and involving no impairment of consciousness. It attacks groups of muscles which cannot be thrown into contraction voluntarily, and the resulting movements show no co-ordination. The proximal segments of the limbs are generally the most affected. The myoclonus ceases during sleep, and it may be diminished or inhibited by voluntary effort. It may appear as a pre-epileptic or post-epileptic phenomenon, or independantly of distinct epileptic seizures. It is a relatively rare condition, on an average only two or three cases are found among 1000 epileptics. Periods of freedom from the myoclonic movements occur, but there is never permanent recovery. It is often a familial disease.

Shanahan's first case, a woman of 37, had fainting attacks from the 18th year, and general epileptic convulsions from the age of 22, but no myoclonus movements till she was 34. The latter were typical; there were nodding movements of the head, smacking, tasting, swallowing and masticating movements; to and fro movements of the tongue, as well as clonic shock-like contractions of the muscles of the limbs and trunk. They were generally more marked after major fits than before them.

The second case was a boy of 15. His brother also suffered from fits and "jerkings." The first epileptic seizure occurred at the age of 11 years, but he had had myoclonic movements for about a year previous to this. On some days he was entirely free from the movements, and they were generally absent for several hours after fits, but then became very severe.

In Clark's case, a woman of 52 years of age, there was a familial tendency to the disease, two cousins being similarly affected. The myoclonus began either immediately before or after the first fit, which occurred at the age of 13. Since then she has had increasing myoclonus movements for two to three

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weeks before the occurrence of an epileptic seizure; thereafter she was perfectly free from movements for two or three days.

GORDON HOLMES.

Sensory and Motor Disturbances above the level involved by definite Organic Lesions of the Spinal Cord.

WEISENBURG (T. H.). *Journ. of Nerv. and Ment. Diseases,* Vol. 34, p. 434, 1907.

TWO cases of traumatic lesions of the spinal cord are reported; in the one the 9th to 12th thoracic segments were involved, in the other the cord was destroyed below the 3rd lumbar segment. In both the lesions were of long duration, being 35 and 23 years respectively, and the sensory symptoms were studied and noted in each at intervals of 7 and 8 years. The areas of sensory disturbance increased in the period of 7 years in the first case from a line drawn two inches above the umbilicus to the first intercostal space, and in the second case from irregular areas over the thighs to a line drawn about one and a half inches above the umbilicus. The author attributed this extension of the anæsthesia to degenerate changes occurring in the cord above the level of the primary lesion, secondary to vascular disease which is itself a result of the primary lesion. As the anterior spinal and the other arteries of the cord form an anastomosing network in the meninges, which is continuous throughout the whole length of the cord its interruption in one place must affect the vascular supply of the contiguous areas; or it may give rise to slowly progressive arterial disease which may finally produce arterial obliteration and thus affect the nutrition and the functions of the neighbouring segments of the cord. In this way the upward extension of the symptoms at a date long after the occurrence of the primary lesion may be explained.

In these and other cases exaggeration of the tendon-reflexes of segments above the level of the lesion has been observed. This may be explained by a disturbance of the physiological relations of the associated parts; it is probable that depresso- and excito-motor fibres pass from the lower to the higher segments of the cord, and that if these are interrupted the functions of the higher segments may be disturbed.

GORDON HOLMES.

Unilateral Paralysis Agitans occurring after Hemiplegia.

SAILER (J.). *Journ. Ment. and Nerv. Diseases,* Vol. 34, p. 425, 1907.

SEVEN years ago a woman of 69 developed right-sided hemiplegia from which she made a partial recovery Four years later she first noticed a tremor in the left arm and hand, which has

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continued till the present time. There is now the typical syndrome of paralysis agitans in the left arm and tremor of both feet, in fact left-sided paralysis agitans with a partial right hemiplegia.

Paralysis agitans is unilateral either when the disease itself is limited to one side of the body, or when the tremor has been inhibited on the one side by the onset of hemiplegia.

GORDON HOLMES.

Radiculitis.

CAMUS and SEZARY. *La Presse Méd.*, No. 68, Aug. 24, 1907.

UNDER this term the authors describe the symptoms and lesions due to inflammatory and degenerative changes in the roots of the spinal nerves. The essential clinical feature is that the symptoms whether sensory, motor or trophic, always correspond to the peripheral distribution of the root fibres; the peculiar symptoms of each case consequently depend on the roots affected. The lesion are rarely primary in the roots; they are generally due to the extension otf inflammatory processes from the meninges, and most frequently to invasion by syphilis or tubercle; or it consists of degeneration of the roots secondary to meningeal disease.

The symptoms may be of rapid onset or they may be slow and progressive. They begin with increasing pain in the peripheral distribution of the fibres of the sensory root or roots affected; the pain may radiate along the nerves and these may be tender to presure. Violent paroxysms of pain may be brought on by any sudden movement or by the increase of intrathecal pressure on sneezing. Various paraesthesiae may accompany the pain. If the disease progresses to destruction of the root fibres the pains cease and there is loss of cutaneous and deep sensation in the regions to which the pains had been previously referred. When the ventral roots are also involved there is some degree of lower motor neurone paralysis in the muscles supplied by them, and secondary to this trophic changes and arthritic deformities.

When there is pain without any objective signs of disease the condition may be known as Radiculalgia; acroparæsthesia is included under this term.

GORDON HOLMES.

Tuberculin as a Diagnostic.

LABBE (M.). *Gazette des Hôpitaux*, July, 1907.

M. LABBE believes that Koch's tuberculin is of great value as a diagnostic agent if used under proper circumstances and with due precautions, but he points out that whilst positive reactions

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may certainly be taken as indicating the presence of tubercular foci negative results do not necessarily signify their absence. Moreover, the positive reaction is as a rule better marked in early stages and in active conditions of tuberculosis. M. Labbe advises that the Koch tuberculin, which contains about 40 to 50 per cent. of glycerine, should be dissolved in sterilised serum in the proportion of one part in a thousand, and that only fresh solutions should be used, because not only do they not keep well, but they are also more active whilst fresh, and he suggests that the following rules should always be strictly adhered to when using tuberculin for diagnostic purposes:—

1. Tuberculin must not be administered to patients who have not been absolutely devoid of fever for three days.

2. The solution of tuberculin, 1 in 1000, must not be more than one week old.

3. The dose for an adult should be one-fifth of a cubic centimetre of the solution, which should be injected into the subcutaneous tissue in the lumbar region.

4. After the injection the patient must be kept in bed and his temperature must be taken at least every six hours.

5. A rise of temperature of 1° may be looked upon as a positive indication.

6. If there is no reaction repeat the dose, four times, at intervals of three days.

ARTHUR ROBINSON.

The value of Chemical and Biological Methods in Medical Diagnosis.

STENGEL (A.). *Univ. Penna. Med. Bull.*, July-August, 1907.

THOUGH cases of various diseases occur in which laboratory aid—necessary in other instances of the same disease—is manifestly superfluous, we must not forget that the clinical distinctions on which such an independent diagnosis rests were established by those who faithfully applied the laboratory tests. The rise and progress of chemical and biological methods is traced by the author in this interesting article. The following test of Sahli for the presence of gastric juice is of recent introduction, and may therefore be quoted in full. A small rubber bag containing methylene blue is securely tied with catgut so that the contents cannot escape unless the catgut is digested. As solution of connective-tissue like that of catgut cannot occur through the action of the pancreatic secretion without the preliminary action of the gastric juice, the bag with its contents will pass through the intestinal tract unopened if gastric secretion is absent. If the catgut is digested the escape of the methylene blue will be promptly recognised by the blue discolouration of the urine.

FRANK E. TYLECOTE.

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Blood Pressure in Typhoid Fever.

BARACH (J. H.). *New York Medical Journal,* Aug. 24th, 1907.

THE author kept blood-pressure charts in 81 consecutive cases of typhoid. His observations were made with a Stanton sphygmomanometer, with an 8 cm. armlet. The average blood pressure is considerably higher in the male than in the female, and is also higher as age advances. In typhoid the pressure is lower than normal, due to the diminished heart force and lowered vascular resistance, and not to the amount of fluid in the vessels, as it was no higher in the patients who drank plenty of water than in those who drank a little. The blood pressure in typhoid bears no relation to temperature or pulse-rate, and is always below 100°. It remains low until convalescence is established, and then returns towards the normal. A steadily falling pressure means grave danger, a reasonable level means that there is some reserve power. Of ten cases in which at one time the pulse, though palpable, could not be distinctly counted, in those in which the pressure fell progressively the patient died; in those in which it did not fall markedly, or, having fallen, began to rise again, even though at this time the pulse had not yet much improved, the patient recovered. Thus the estimations were of some value in prognosis. As regards drugs, the results were not so definite; a preparation of digitalis, which was known to be active as it had caused rise of pressure in two chronic heart cases, did not affect the pressure in five typhoid cases. Strychnine seemed to regulate the blood pressure more evenly, but did not change the level. In one case of perforation the blood pressure did not show any alteration. In a case of complicating œdema of the larynx, with progressive asphyxia, the pressure rose in twelve hours from 95 to 125, and in the twenty-four hours after tracheotomy fell to 65. Pain, mental effects, and hydrotherapy, all raised the pressure; raising the foot of the bed for some hours had no effect; rest in bed and light diet naturally were found to lower pressure. When other diseases have been similarly studied, blood pressure estimation may be found to be of value in differential diagnosis, and to give indications as to what drugs may be usefully employed in the different conditions.

FRANK E. TYLECOTE.

The Abdominal Complications and Sequelæ of Typhoid Fever.

FRAZIER (C. H.). and THOMAS (B. A.). *Univ. Penna. Med. Bull.,* July-August, 1907, pp. 79—93.

THE writer has found references to eight cases of acute intussusception complicating typhoid. Such cases are usually diagnosed as perforation, and it is only at operation or autopsy that the mistake is discovered. Severe pain is constant in intussus-

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ception at the onset, and collapse is more extreme and rapid than in perforation. Rigidity, distension, and local tenderness are not characteristic of intussusception until peritonitis sets in later. In many cases seen six or twelve hours after perforation there may be a reasonable doubt as to the occurrence of a recent serious abdominal crisis, this is never so in intussusception. In typhoid intussusception the need for immediate operation is even greater than in perforation, and operation gives a fair prospect of recovery. Volvulus is another condition which may complicate typhoid, of this there are seven instances on record, and in no case was the diagnosis made during life. Suppurating mesenteric lymph-glands may rupture and cause acute abdominal symptoms; in one case of the writer's the patient immediately announced to his fellow patients that "something had given way inside." Manifestations of appendicular trouble in the course of typhoid are placed in four groups:—(i.) the case is at first erroneously diagnosed as appendicitis; (ii.) an undoubted appendicitis, initial or recurrent, occurs during the acute stage; (iii.) where the specific typhoid inflammation involves the appendix, and may go on to ulceration or perforation; (iv.) where appendicitis developes during convalescence or later, and there appears to be some direct or indirect causal relation. Single cases have been reported of strangulated Meckel's diverticulum in the course of typhoid (Frazier and Sailer) and of typhoid pancreatitis (Moynihan. Fæcal impaction has been found to simulate perforation, but here the symptoms subside on emptying the rectum; these cases occur especially in children and a continuous diarrhœa soon ensues, and often leads to a correct diagnosis of the cause of the trouble; a leucocytosis in children may occur, but is of little significance, as it is often well marked in the absence of any active inflammation. Peritonitis without perforation occurs about one-third as often as the perforative form; in some cases the inflammation extends through the base of a deep ulcer, in others the migration of bacilli takes place through an intestinal wall only slightly abnormal. As regards the post-operative treatment in typhoid laparotomies the writers do not recommend the Fowler position: they recommend continuous enteroclysis by the Murphy method, and give liquid food by mouth twelve hours after operation, supplementing mouth feeding by nutrient enemata.

FRANK E. TYLECOTE.

A Clinical Lecture on Infantile Diarrhœa.

STILL (G. F.). *The Medical Press,* August 28th, 1907.

IN spite of all the advances in sanitation and milk supply infantile diarrhœa is on the increase. There are more deaths between three months and six months of age than under three months,

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because more children are fed on the breast during the latter period. Ninety-six per cent. of children dying from diarrhœa are hand-fed. Condensed milk is very dangerous, and children taking it incur special risk of diarrhœa. There is some connection between the rises of temperature and the deaths, but the connection is not quite clear. Classification is difficult as the types described merge into one another. A point to be noted is that otitis media is a common complication. Treatment must be prompt, and the patient must be closely watched from the first, almost from hour to hour if possible. As regards feeding, milk must be stopped, and the following substitutes used: (1) veal or chicken broth; (2) cereal decoctions; (3) albumen water; (4) very weak tea; (5) plain water. This list is in order of strength, and if the child has recovered enough to get back to broth, the next stage is to whey or sherry whey.

It is often necessary to give very short feeds during the acute stage. In collapse a saline infusion under the skin combined with a stimulant if absorption is slow, may have a wonderful effect. Brandy is useful as a stimulant and carminative. As regards drugs, opium is first on the list as it rarely causes retention of the foul diarrhœal secretions, though such a possibility must always be thought of. Dover's powder three times a day in doses of $\frac{1}{8}$ gr. under 3 months, $\frac{1}{4}$ gr. from 3 to 6 months and $\frac{1}{2}$ gr. over 6 months is best, and may be combined with pulv. Hydrarg. c. Cret. Castor oil and bismuth are both good, and should be given in the form of mixtures. Disinfectants are not of great value. Rectal irrigation with plain saline is also useful when there is ileo-colitis and much slime is passed.

C. P. LAPAGE.

The Auscultation and Percussion Findings of the Heart in late Childhood.

BUTLER (W. J.). *American Journ. of the Med. Sci.*, 1907, p. 80.

THE author examined 100 children free from cardiovascular or renal disease, anæmia and other diseases. He sums up his findings by stating that the upper border percussed in the parasternal line is most frequently found on the third rib, less often in the second or third interspace; that the right border may extend 0.5 to 2 cm. to the right of the sternum, as indicated by a slight relative dulness only; and that the apex, while most frequently found in the fifth interspace inside the nipple line, may be found outside of it. It is seldom in the fourth interspace, in which event it is as often inside as outside of the nipple line.

The change to the recumbent posture gave no alteration in more than half the cases but if any change took place it was either elevation of the upper border or diminution of the right border. The apex beat was unchanged in more than half

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though at times it became less distinct or ascended. Murmurs were heard in 64 cases, in the erect posture in 18, and in the recumbent in 46. Murmurs heard in the erect posture persisted in the recumbent. Those heard in the erect position were always systolic. Apical and pulmonic murmurs were intensified and well heard along the left side of the heart if the child was on the left side. In the right lateral position the murmur sometimes appeared along the right side of the sternum and was louder over the aortic area than in the dorsal position, while in a few children it occurred for the first time over the aortic area under these conditions. These murmurs must in all probability be regarded as accidental and cardio-pulmonary in origin as position and respiratory movements exerted such a marked influence. The arterial tension averaged 119 m.m. Hg. so the murmurs were not due to low arterial tension. The cause of these murmurs appears to be, as has been pointed out, the varying tension exerted by the heart on the overlying and adjoining lung tissue which, when diminished during the systole of the heart, permits of air entering or being sucked into previously compressed vesicles, thus giving rise to a cardiopulmonary gush in the systolic phase of the heart cycle.

The increase in loudness of the murmurs often when the subject is placed in the left-sided position, and the appearance of the murmur to the right of the sternum, where it had not previously existed, when the child was placed in the right lateral position, is strong support of the above premises of their causation. Likewise, the fact that if the intrapulmonary tension is increased by deep breathing and holding of the breath, the murmur often disappears entirely, is equally convincing. The ascent of the heart in the recumbent position probably accounts for the greater frequency in that position. These murmurs are devoid of pathological significance and the systolic murmur is only one of the several signs essential in the diagnosis of valvular lesions.

C. P. LAPAGE.

Low Blood Pressure—Actual and Potential.

WILLIAMS (LEONARD). *Clinical Journal*, May 1st, 1907.

Two factors may cause low blood pressure, feebleness of ventricular contraction or deficient peripheral resistance in the systemic circulation. It is only when both factors are present that an unduly low blood pressure exists, as ordinarily with deficient peripheral resistance the heart beats more rapidly. In cases of tachycardia which cannot be explained by a cardiac lesion one ought to consider the tonicity of the arterioles. The stability (or instability) of the pulse is of value; normally the difference between the pulse-rate in the recumbent as compared

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with the upright position is 8 or 10 beats per minute. When these rates approximate the blood pressure is raised, when these rates diverge the blood pressure tends to be low. Surgical shock and collapse show a markedly low blood pressure, as in these conditions the abdominal vessels are usually dilated. Other causes of low blood pressure may be either (*a*) toxins of endogenous or exogenous origin, or (*b*) developmental error. The tubercle toxin causes vaso-dilatation, and therefore with a tachycardia which by the postural method shows deficient vaso-motor tone, we should suspect tuberculosis; some other wasting diseases, *e.g.*, carcinoma, also cause a potential low blood pressure. Tuberculosis is associated with low blood pressure just as gout is with high blood pressure. Loss of vaso-motor control is frequently the cause of cyclical albuminuria. Neur-asthenia is associated with low blood pressure. In typhoid fever the commonest severe complications are hæmorrhage, collapse and perforation; in hæmorrhage and collapse a fall in blood pressure occurs, whilst in perforation there is usually a marked rise.

J. D. MARSHALL.

Some of the Consequences of High Blood Pressure.

WILLIAMS (LEONARD). *The Medical Press,* July 3rd, 1907.

THE writer points out that high blood pressure is usually looked upon as a result of renal disease, but that it is frequently primary and due to certain toxins (gastro-intestinal), the arterial degeneration, either atheroma or arterio-sclerosis, being secondary. Several interesting cases are described; one patient, who suffered from hæmoptysis, had no evident tuberculous disease of the lungs, cardiac disease nor renal disease. He had a blood pressure of 190 mm. Hg.; the hæmoptysis was probably due to rupture of a branch of the bronchial arteries (systemic circulation).

A patient with a blood pressure of 200 mm. Hg. was suffering from hepatic cirrhosis of the alcoholic type, a condition probably brought about by high arterial tension, long continuance of which had caused a sclerosis in the hepatic vessels.

J. D. MARSHALL.

Perforation in Typhoid Fever, and its Relation to Blood Pressure.

SHEPPARD (A. L.). *Lancet,* May 11th, 1907.

THE writer records five cases of perforation in typhoid fever; in two cases a rise of blood pressure occurred, in two no change occurred; one case of perforation was associated with severe

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hæmorrhage. He compares these readings with those given by Crile, who found in each of five cases reported that the blood pressure rose immediately after perforation. His conclusions are that rise of blood pressure does not appear to be as certain or valuable a sign as Crile's figures indicate. Amongst the recognised signs of perforation should be placed a rise of blood pressure, although a stationary pressure is no indication that the catastrophe has not occurred. J. D. MARSHALL.

The Control of Super-normal Arterial Pressure.

OLIVER (GEO.). *Lancet*, May 18th, 1907.

IN a paper read before the Therapeutical Society Dr. Oliver pointed out that a rise of blood pressure may be temporary or permanent, in the former case being produced usually through nervous influences, in the latter being due either to some organic change in the circulatory system or to some alteration in the chemical composition of the blood plasma. A high blood pressure may in some cases be compensatory and therefore a necessary evil. For the reduction of super-normal arterial pressure Dr. Oliver recommends a reduction of the ordinary diet as a whole, with diminution in the animal and an increase in the vegetable food. Little fluid should be taken with meals; alcohol as a general rule is better avoided. Salt may be replaced by a mixture of the benzoates of potassium and lithium, potassium and sodium chlorides. As smoking produces a definite rise of blood pressure it is undesirable and should be limited. The value of rest is emphasised. Balneological treatment is of use, especially hot douche baths with massage, followed by needle baths. The cutaneous circulation should be well maintained by warm woollen clothing, occasional Turkish baths with massage. Cold windy climates should be avoided. In medicinal treatment free evacuation and correction of the bowels and liver should be obtained. Cardiac depressants should not be given, but drugs varying the calibre of the arteries may be used with advantage, *e.g.*, ext. thyroidei. He finds that iodides do not reduce high arterial pressures; they act beneficially in arterio-sclerosis, probably by their action on the thyroid gland (Stockman, Rolleston). J. D. MARSHALL.

The Physiological Action of the Pancreatic Enzymes, with special reference to Hematology, Urinology, and Clinical Pathology.

CLEAVES (MARGARET A.). *Med. Rec.*, 1907, p. 885.

THE author is a believer in the value of pancreatic ferments as therapeutic agents through the method is not without its dangers. Details are given of cases of malignant and tubercular

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disease where marked improvement followed the hypodermic injection of trypsin and amylopsin. The injection of the former is followed by severe local reaction, and in one-half to two hours symptoms of toxæmia manifest themselves in the form of chills, fever, sweating, rapid pulse, increased respiration and, not infrequently, a rash. A moderate leucocytosis of 9,000 to 14,000 cells per c.cm. is shown in the first week, but the distinct and characteristic eosinophilia that occurs probably forms a tentative, working criterion of the efficacy of the treatment. Habershon has pointed out the close alliance, if not the identity, of glycogen and eosinophilia granules and it is probable that the specific action of trypsin in cancer is to cause conversion of the greater part of the proteid molecule into glycogen, thus causing the destruction of the cell. The author does not believe that it is necessary to inject trypsin locally. Hypodermic injection is more efficacious than rectal administration, but the latter should be tried if injection prove too painful. Trypsin acts on the sympathetic nervous system as shown by interference with the circulation in glandular structures such as the breast and by relaxation of sphincter muscles as for instance the anal sphincter and that of the os uteri. Nephritic changes also occur, no doubt due to excretion of trypsin by the kidneys. Casts and albumen appear almost immediately after the first doses of either trypsin and amylopsin. Amylopsin, however, does not produce so marked a local reaction at the site of injection as does trypsin.

The use of pancreatic ferments in tuberculosis has only received a limited trial, but the author thinks that it is probable that favourable results will be recorded since it has been noted that unfavourable cases of tuberculosis are marked by absence of eosinophilous cells in the blood, and it is justifiable to presume that the increase of eosinophilous cells that follows the injection of trypsin must mean a curative action. E. N. CUNLIFFE.

Congenital Curvatures of the Bones of the Leg and Infantile Pseudarthroses.

RABÈRE. *Gazette des Hôpitaux,* 1907, No. 101.

THIS paper is based upon a case of the writer's in which a pseudarthrosis resulted from fracture of both bones of the leg already deformed by congenital curvature. The fracture occurred at 9 months from slight injury, and was overlooked till a month later, when abnormal mobility was accidentally discovered. On examination at the age of 12 months no union had taken place, the left leg presented a curvature with convexity forwards, and the foot was in equinus with slight valgus. The solution of continuity was at the junction of the lower and middle thirds; there was neither atrophy nor enlargement of the ends of the fragments; crepitus, soft and painless, was occasionally obtained. The line of fracture at the same level in both bones was from

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above downwards and forwards. There was no shortening nor atrophy of the limb. Operative treatment was declined. Eleven months later no change had taken place.

The writer points out that intra-uterine fractures can no longer be maintained as an explanation of these cases. Careful analysis of cases, the complete absence of callus, the usually very marked atrophy of the limb and the pathological researches of Nové-Josserand and others have led to the recognition of congenital curvatures of the tibia and fibula as a distinct morbid entity. They are allied to those cases of congenital absence of one of the bones of the leg and other malformations, and, like those, are probably due, as first suggested by Dareste in 1882, to amniotic adhesions.

Notable features of these cases are atrophy of the limb, equinovalgus position of the foot and abnormal fragility. Fractures are very frequent, mostly in the first years of life, and are very often spontaneous or follow slight traumatism. There is little tendency to union, and in most cases pseudarthrosis results.

The prognosis is bad and treatment unsatisfactory. Operative measures should not be undertaken lightly on account of the limited chances of success and of risks to the child. When the curvature is abrupt, however, an attempt should be made to correct the deformity. Linear or cuneiform osteotomy is preferable to osteoclasis. At the same time the position of the foot must be corrected by wrenching or tenotomy. In certain cases, *e.g.*, those with congenital absence of the fibula, it may be necessary to do an arthrodesis at the ankle. Both in operating and during the after treatment the great tendency to non-union must be kept in mind.

In cases of pseudarthrosis immobilisation should always be tried. If, as usually happens, this fails, operation should be undertaken without delay. The writer mentions the various devices employed to secure coaptation and fixation, the number of which sufficiently indicates the difficulties met with. Reichel has devised an ingenious grafting operation in which an osteoplastic flap consisting of integument, periosteum and a section of the tibia is reflected from the front of the sound leg and applied to a prepared gap at the seat of fracture of the tibia, the fibula having been previously exposed and an ivory peg inserted subperiosteally to restore its continuity. The graft remains attached by its pedicle, and the legs are crossed and encased in plaster. On the twentieth day the flap is cut away from the sound leg and the plaster re-applied to the other limb. Reichel had an excellent result in his single case, the only drawback being that the child persisted in fracturing the leg from which the graft had been taken.

G. R. Mill.

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Surgery.

Improved method in the successful operative treatment of Cleft Palate.

ROBERTS (J. B.). *Amer. Journ. of the Med. Sci.*, 1907.

AT the conclusion of this paper Dr. Roberts states his opinions as follows:—

Cleft palate should be operated upon as soon as possible after birth. Accompanying harelip should not be treated until after the palate operation. When the operation is done during the first six months of life, Brophy's tie beam method should usually be adopted.

After six months of age, the Lane flap method should generally be employed. At times it may be needed as a supplement to Brophy's method in younger patients. Brophy's method for these cases by means of silver-tension sutures and coaptation sutures with lead splints, or plates, applied to the inferior surface of palate flaps, is also very valuable.

Mechanical appliances to close the fissure are inferior to operative treatment, which has a low necessary mortality.

Instruction in speech is a necessary adjuvant for satisfactory results.

He discusses and describes the various operations referred to and states that he has considerably modified his views of late years and come to these conclusions as the result of practical experience.

C. P. LAPAGE.

Inguinal Hernia in Children.

CLOGG (H. S.). *Practitioner*, Sept., 1907, p. 364.

THIS is an article, based on an experience of 126 cases, all of which were of the indirect variety. The author brings forward several arguments in favour of the accepted view that the sac is due to congenital errors; weakness of the surrounding tissues is only a later effect of the unreduced hernia. He rightly goes further and insists that the majority of hernia in adults have a similar origin.

Herniæ in children, he divides into two groups, those with "total funicular" sacs (the old congenital herniæ), and those with "partial funicular" sacs (the old funicular herniæ); he does not think that the infantile form merits a separate class. In 115 males the former variety was present in only 10 per

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cent. A cure by a truss is a doubtful event, at any rate it only comes about by a delayed closure of a congenital canal.

Circumcision, the cure of diarrhœa and various other ills, can have no effect on the hernia, and operation is the correct treatment; it should be performed at the 3rd or 4th month or rather later, if the child is not weaned. Operation is called for even earlier than this in certain special conditions: (1) strangulation, (2) repeated attacks of irreducibility, (3) large herniæ, which are usually cæcal, (4) inefficiency of the truss.

The operation exactly resembles that in the adult; the external oblique should be divided to expose the entire cord; the various covering layers are more distinct than they are in later life and the sac is exceedingly fragile. The bladder is frequently in close relation to the sac and may easily be drawn up into the wound, its presence should be suspected if much subperitoneal fat is seen.

The modified Bassim's operation is the method used generally, but in larger herniæ with weak muscles, the original form is used. Catgut is the suture material, the subcutaneous suture being used. There have been no fatal results from the 126 operations; suppuration was noted in 6 cases. The sac is nearly always empty at the time of operation.

In the series are included two cases of congenital hernia of the cæcum, one hernia of the bladder, three examples of appendicitis affecting the hernial sac. Eleven herniæ affected female children and in 3, the ovary and Fallopian tube formed the contents. Twice tubercular peritonitis had attacked the sac; its presence being unsuspected.

LAWRENCE JONES.

The Removal of Thyroid Tumours.

BARKER (A. E.). *Practitioner,* September, 1907, p. 329.

As far as possible local anæsthesia should be used, and it should be one's aim to render insensitive not only the skin but the whole field of operation. The solution is prepared as follews: A fresh 2 per 1,000 solution of β-eucaine in normal saline is boiled in a small flask, and to 100 c.c. are added ten drops of a ·1 per cent. solution of adrenalin chloride. The chloride is purposely made dilute, so that a large quantity may be used. About 30 c.c. are first injected all along the line of the skin incision, the injection being made into the skin and not under it, and then 40 c.c. or more are injected into the subcutaneous tissues by means of a long needle with a blunt end and laterally placed eye, introduced into a puncture made by a sharp needle. This produces a temporary œdema of the tissues which passes off by the time analgesia is at its height in about forty minutes.

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The author now uses Kocher's curved transverse incision, and divides the cervical fascia vertically in the middle line; he considers it much the best method. The notes of twenty-two cases are appended.

LAWRENCE JONES.

Intradural resection of the Posterior Roots of Spinal Nerves.

JACOBY (G. W.). *New York Medical Journal*, p. 192.

SUCH operations are not sufficiently recognised, and their performance is thought more dangerous than is warranted; the author does not consider them any more severe than laminectomy. The nerve fibres which go to form the plexuses constitute groups in which no very definite functional arrangement can be made out and which in their course do not correspond to any real systematisation; but the relation of the posterior nerve roots to their dermatomeres is very simple. The dermatomeres assume the form of circular bands arranged at levels, each level succeeding the preceding one in the order of the nerve roots themselves.

In the operation it is possible to determine the root to be cut by its relation to the spinous process aided by the direct excitement of the corresponding anterior root.

In the resection no traction should be made on the root; proximal traction may damage the cord, distal traction the anterior root which is in close apposition.

According to Chipault, it is possible to resect 1 cm. in the cervical region, 2 cm. in the dorsal, 3 cm. in the lumbar, and 4 cm. in the sacral.

The indications for the operation are:—

1. Persistent neuralgias of mixed nerves, in which the motor functions of the nerve are intact and in which these are of sufficient importance to warrant their preservation.

2. Neuralgias of radicular origin.

3. Symptomatic neuralgias in which the cause of the pain can be abolished by no other means and as a palliative measure when the cause is irremediable.

There is a full account of a case under the author's care, and a table gleaned from the literature on the subject.

LAWRENCE JONES.

Displacement of the Semilunar Cartilage of the Knee Joint.

RAWLING (L. B.). *Practitioner*, Sept., 1907, p. 356.

THE semilunar cartilages may be regarded as two complete interarticular discs, the central portions of which have become worn away with the result that a sharp edge projects toward

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the tibial spines while the peripheral parts retain their thickness. On purely anatomical grounds one would expect the internal semilunar cartilage to be the one most commonly affected. Very rarely the cartilage is torn from its coronary attachment and folded inwards towards the intercondylar notch; much more commonly the anterior part of the cartilage is detached from the tibial spine and may occupy any position from the triangular space between patella, tibia and femur to the intercondylar notch. Usually it lies between these two extremes, liable to be nipped at any time in the movements of the joint.

The author has not much opinion of the value of palliative treatment and condemns any operative measures short of excision. The three main factors in securing a successful result are absolute cleanliness, the avoidance of hæmorrhage into the joint, and early massage and movement.

A flap incision is recommended with vertical division of the internal lateral ligament and synovial membrane, all bleeding points should be ligatured as they are seen. Deep catgut and superficial fishing gut sutures are used. The stitches are removed on the 7th day when the joint is moved, and massage is commenced on the 10th day. No violent exercise should be undertaken for at least six months.

LAWRENCE JONES.

Two cases of Jejunostomy by a new method.

DRUCBERT (J.). *Arch. Générales de Chirurgie,* July, 1907, p. 21.

THE author appears to consider this operation of more general application than usually supposed, and mentions as indications extensive gastric carcinoma, severe burns of the œsophagus and stomach and intractable gastric ulcer. At the same time the condition of the patient is not such as to warrant any lengthy operation, and simplicity is its great recommendation. Absolute continence of the fistula is also a necessity; the author's new method resembles Marwedel's form of gastrostomy, just as that of von Eiselsberg is modelled on the method of Witzel. A median laparotomy incision is made, and the first coil of jejunum is fixed vertically by its serous coat to the parietal peritoneum, which is completely closed above and below this so that the rest of the operation is extra-peritoneal. A vertical incision is made through the serous and muscular layers of the jejunum, thus exposing the mucous coat, which is opened at the lower end of this incision; the opening made is a small one, and the edges should lightly embrace the tube, which is introduced and fixed by one catgut suture. The tube is now buried by bringing together the muscular and serous coats and the edges of the abdominal incision at the upper end of which

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the tube leaves the abdomen. This proceeding does not narrow the lumen as does the method of von Eiselsberg, nor does it modify the anatomy of the part so much as the Y-operation.

LAWRENCE JONES.

Inguino-interstitial Hernia and Hernia "en bissac."

BAUDET (R.). *Archives Générales de Chirurgie,* No. 2, p. 80.

By the former name the author wishes to denote a hernia which occupies the inguinal canal and the space between the large muscles without leaving the external ring. The biloculation of the sac is more or less marked. It bears some analogy to pro-peritoneal hernia in which the sac is placed between peritoneum and fascia transversalis and masked by the resistant layer of oblique and transverse muscles.

Tillaux considered that stenosis of the external ring and maldescent of the testis are necessary for its causation; but this is not so, for it may occur in women, and really it is not very far removed from the hernia en bissac of Berger in which there is, in addition, a sac reaching the scrotum.

The interstitial sac is nearly always placed between the internal and external oblique muscles; it is usually of large size and may reach the umbilicus, whereas the inguinal sac is small; it is doubtful if the sac ever extends between the internal oblique and transversalis, but it may, though rarely, separate the transversalis and transversalis fascia. The internal ring is said by Schmidt to be displaced outwards and backwards, but Berger considers this to be merely the result of stretching. The external ring is usually very reduced, but this is not always the case.

In man the testis is always retained and adherent to the posterior wall of the sac. To the hernia en bissac Baudet applies the name scroto-inguino-interstitial to signify the triple nature of the sac. Here the testis may have descended to the scrotum, but never reaches the bottom of the sac.

The author gives an account of two personal observations of the former hernia in women. Hernia en bissac may also occur in women, the lower segment occupying the labium majus. Many of the earlier reported cases were strangulated. Tillaux considered that the strangling agent was spasm of the muscles, a theory which is disproved by actual fact; really the constriction is at the neck of the sac in the internal ring. As to the actual cause of the condition in men, it is certainly a developmental error, but it is not directly due, as Tillaux thought, to ectopic testis and narrowing of the external ring, but these are rather co-existent manifestations of a congenital fault.

The author also opposes the view that the hernia is due to a misplaced internal ring, and considers that the interstitial sac is

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preformed as a small diverticulum from the processus vaginalis. Various other possible causes of obstruction at the external ring have been adduced, such as a large testis, a lipoma or a small adherent hernia.

LAWRENCE JONES.

Anatomical and Physiological Observations on a first thousand cases of Spinal Cord Anæsthesia.

KRÖNIG (B.) and GAUSS (C. I.). *Münch. Med. Woch.*, Oct., 1907.

THE investigations which Prof. Krönig and Dr. Gauss have made in association with spinal cord anæsthesia are extremely interesting both from a purely scientific as well as from a strictly practical point of view. The dangers which have to be taken into account in association with the production of spinal anæsthesia are: (1) The rapid extension of the anæsthetic action to the medulla and the death of the patient. (2) The rapid absorption of the anæsthetic and general poisoning. (3) The possibility that the anæsthetic may cause permanent injury to the tissues of the spinal cord.

The authors arrive at the following conclusions. (1) That there is no danger of the extension of the anæsthetic action beyond the point it is desired to reach if proper precautions are taken. (2) There is practically no danger on general poisoning if proper doses of advisable drugs are used. (3) It is admitted that in cases subjected to spinal cord anæsthesia which died in consequence of extension of the action to the medulla and also in other cases which died from other causes. Marked changes have been discovered in the cells of the cord, but it must be remembered that similar changes have been found where spinal cord anæsthesia had not been practised and in which no symptoms of spinal cord disease were present during life. Admitting, however, that there is danger from occasional direct injury to the cells against the disadvantage must be balanced the fact that patients who have been subjected to spinal cord anæsthesia associated or not with " skopolamin-morphia-partial narcosis " are not subjected to the complications which often follow inhalation narcosis and as a consequence the death rate from pulmonary complications after operation is reduced and there is less danger of the wounds being opened up as a result of vomiting, etc. The author's conclusion regarding practical considerations are based largely upon the following facts which have been demonstrated by their researches. (1) That in the sitting posture there is no appreciable amount of cerebro-spinal fluid in the subarachnoid space of the cord above the level of the thoracic region, (2) that the fluid does not run to the height of the medulla when the body is recumbent if the

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head is raised, (3) that it does rise to the medulla if the pelvis is raised when the patient is recumbent, (4) that the admixture of Stovain's solution, which they have usually employed with the cerebro-spinal fluid, can be brought under strict control, (5) that the height to which its action will extend depends upon the specific weight of the solution; the lighter it is in relation to the specific weight of the cerebro-spinal fluid, the further up the cord will its action be exhibited, (6) the height to which the cerebro-spinal fluid extends can be proved by connecting the puncturing needle with a vertical glass tube and this should always be done. In practice the anæsthetising fluid must be introduced through a second puncture and it must be at a given temperature, less than 38°C., so that it will first sink and affect the lower areas, next, as it gets warm, it will rise and will reach a height corresponding with its specific weight which must of course be decided upon before the injection is made. The specific weight can be altered at will by combining the anæsthetic with salt solutions of different densities. The operation is therefore simple, the extension of the anæsthetic absolutely under control and the results are apparently excellent. ARTHUR ROBINSON.

Landmarks in the Biliary and Pancreatic Ducts.

ROBINSON (B.). *Medical Record,* August, 1907, No. 1,920.

DEFINING a " landmark " as " a point for consideration," which is certainly a new definition, Dr. Byron Robinson holds that there are four such landmarks in association with the biliary and pancreatic ducts—(1) pelvis of the gall-bladder where there is frequently a funnel-like dilatation called Hartman's pouch, at the junction of the gall-bladder with the cystic duct; (2) the cystic duct; (3) the intra-pancreatic segment of the bile duct; (4) Vater's diverticulum and its relations to the bile and pancreatic ducts; (5) the terminations of the pancreatic ducts. The first is important, because a calculus may lodge there and cause pain and inflammation even if it does not act as a ball-valve. The second, on account of its spiral valve, is associated with the intense pain caused by the passage of a gall-stone. Inflammations of the third, caused by the passage of gall-stone, may extend to the head of the pancreas, causing in that organ induration and hypertrophy or atrophy. The fourth is interesting, since it serves as a common chamber in which the secretions of the pancreas and liver are mixed before entering the duodenum, this being, in the author's opinion, a circumstance of great importance. The interest of the fifth lies in the variability of the terminations of the duct. Usually there are two ducts from the pancreas—Wirsung's and Santorini's. The former generally ends in Vater's ampulla, but it may open directly into the duodenum, and Santorini's duct always opens directly into the duodenum at a varying distance from Vater's ampulla.

ARTHUR ROBINSON.

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Hæmostasis in Wounds of the Superior Longitudinal Sinus.

REVERSTORF. *Zentralblatt für Chirurgie,* September 21st, 1907.

PARTIAL division of the superior longitudinal sinus is a frequent complication of depressed fractures of the skull, and the wound usually takes the form of an oblique tear in the upper portion of the vessel wall. The free hæmorrhage which results from such a wound can be easily dealt with by the following simple manœuvre:—A fine needle armed with thin catgut is passed through the dura mater a little to one side of the sinus. The catgut is then drawn across the wound and the needle passed in the same fashion through the dura mater close to the sinus on the opposite side. These sutures do not penetrate the wall of the sinus at all. The suture is tightened and the hæmorrhage is at once arrested. One suture is often sufficient, but two or three may be needed. Whilst the suture is being passed the hæmorrhage is arrested by pressure of a finger on the wound.

E. D. TELFORD.

Resection of the Infra-orbital Nerve.

DREESMANN (W.). *Zentralblatt für Chirurgie,* Aug. 31st, 1907.

THE author believes that the following method has many advantages, as it leaves no external sign and allows of the easy and thorough exposure of the nerve throughout its whole course in the superior maxilla. The incision is made in the mucous membrane above the gum between the central incisor and the second bicuspid. With a raspatory the peritoneum is peeled off the upper maxilla to the level of the intra-orbital foramen. With chisel and hammer a small window is made in the wall of the antrum below the foramen. The nerve is now freed at its exit since the lower border of the foramen has been removed. The mucous membrane covering the infra-orbital canal is now incised and the flaps pushed a little to each side of the incision. It is now easy to remove piecemeal the thin bony floor of the canal and free the nerve for its whole length in the canal. The nerve is then divided or avulsed. The hæmorrhage is very slight and is easily controlled, whilst, owing to the excellent drainage, the risk of infection of the antrum is nil.

E. D. TELFORD.

A new method of Extension in the treatment of Fractures.

STEINMANN (F.). *Zentralblatt für Chirurgie,* August 10th, 1907.

THE results of treatment in fractures as demonstrated by radiography are still often of a most unsatisfactory character and many of these fractures involve deformity and disability to the

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patient for the rest of his days. Such results are usually due to imperfect apposition and fixation of the fragments.

In securing a proper apposition an efficient method of extension is essential and such extension should be attempted with weights much heavier than those usually employed. If weights of 20-30 kilos are to be used safe and efficient—means of attachment—by strapping are difficult to devise and carry out in practice.

Steinmann suggests a new method and illustrates it by an account of its use in a fracture of the shaft of the femur. Two long sterilized steel nails with broad heads are driven one into each condyle of the femur. The extension is arranged to pull from the heads of the nails which project about one centimetre above the surface. An extension so applied is easy to manage and allows of the use of heavy weights without pain. With ordinary precautions there is no risk of immediate or subsequent infection of the punctures.

E. D. TELFORD.

The after-treatment of the wound in Amputations of the Breast for Carcinoma.

SCHLESINGER (A.). *Zentralblatt für Chirurgie,* August 24th, 1907.

IN order to avoid stiffness in the use of the left arm after radical operations for malignant disease of the breast Ewald has suggested the fixation of the arm in an elevated position for the first few days after operation.

Schlesinger regards the stiffness which occurs as due to the organization of blood clot in the large axillary wound and suggests that the true prophylaxis consists in efficient hæmostasis together with careful padding of the axillary dressing to avoid the occurrence of any free space beneath the flaps.

In v. Bergmann's practice the axilla was carefully packed with small tampons which were held accurately in position by a turn of bandage. The arm was then fastened to the side and free movement could be confidently reckoned on within three weeks of the operation.

E. D. TELFORD.

Cancer of the Rectum.

CRIPPS (H.). *The Clinical Journal,* September 11th, 1907.

EVERY case of carcinoma in this region is of the adenoid type, and the clinical histories of the cases strongly suggest a parasitic origin for the new growth. There is no essential difference between the so-called adenoid polypi and adenoid carcinoma;

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grows freely into the lumen, and after removal does not as a rule recur; the adenoid carcinoma is the same growth extending outwards and infiltrating the rectal wall. Irritability of the rectum is a very characteristic sign, and this irritability is accompanied by a discharge which differs from other rectal discharges in being dark-brown in colour from admixture of blood. In the majority of cases the growth begins within two to three inches of the anal orifice, and presents itself clinically as a hard well-defined ring of induration. Invagination of the growth is common and may produce deceptive results to the examining finger unless the possibility of such occurrence is borne in mind. It is essential that no force be used in examination, as these growths are very friable, and tears extending through the peritoneum may easily result.

Cancer of the rectum has probably a low malignancy, and if removed early the prognosis is very good. Its apparent high malignancy is due to the late date at which cases present themselves for operation. Fixity of the growth is of the greatest value in prognosis. If the growth has escaped beyond the muscular coat of the rectum it is inoperable. With modern methods of operating the height of the growth is a matter of less moment. In the irremovable cases colotomy is indicated not merely as a prophylaxis against obstruction but for its distinct effect in diminishing the rapidity of the cancerous growth.

E. D. TELFORD.

Villous Papillomata of the Rectum.

RICKETTS (B. M.). *New York Med. Journ.*, August 31st, 1907.

THE cause of papillomatous growths of the rectum is not known, but they appear usually in patients between 35 and 60 years of age, and affect both sexes equally. In structure they are velvety, very smooth, single or branched, and they bleed readily. They originate in the mucous membrane or superficial layers of the submucosa and are most frequently situated within three inches from the anal orifice upon the posterior rectal wall. Tuttle states that "the insertion of the pedicle into the rectal wall without induration, with preservation of suppleness and normal constituency distinguishes these growths clinically from cylindrical epithelioma, and gives them the right to be classed among the benign neoplasms of the rectum."

Papillomata lead to a profuse and frequent discharge of a yellow, turbid, albuminous secretion. Other symptoms often present are constipation, prolapse, hæmorrhage, tenesmus, emaciation and increased frequency of micturition. They can usually be removed through the anus after careful ligature of

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their pedicles, but in some few extensive cases a trans-sacral excision is necessary in order to deal efficiently with the disease. The author gives a detailed account of thirteen cases of the disease. E. D. TELFORD.

Cancer of the Rectum.

ATKINSON (STONEY R.). *Medical Press and Circular*, September 18th, 1907.

CANCER of the rectum may be divided into three types—

(1) The ulcerous—a nodular growth or plaque involving part only of the circumference of the gut. Sooner or later this breaks down and forms a typical malignant ulcer.

(2) The cauliflower—forms a large rough irregular cauliflower-like growth projecting into the lumen of the rectum. It does not tend to ulcerate, but may produce obstruction.

(3) The annular—tends early to involve the whole circumference of the gut, ulcerates early and causes by its contraction a well-marked constriction of the canal.

The author points out the importance of the relationship between cancer and hæmorrhoids. Not only does the unfortunate patient suffer in some cases owing to his malignant disease having been diagnosed as hæmorrhoids, but the malignant disease may by its presence induce hæmorrhoids. It is therefore a practical point of much value that where hæmorrhoids arise for the first time at 40 or 50 years of age the presence of malignant disease must be suspected.

The author gives an account of the various methods of removal, and in cases unsuitable for radical treatment advises an early colotomy. E. D. TELFORD.

The Blood Supply of the Rectum in view of Operative Gangrene.

SUDECK (P.). *Muench. med. Woch.*, 1907, No. 27.

THE writer has had two deaths from gangrene after operation for cancer of the rectum. He points out that whereas the mobile portions of the bowel are provided with abundant anastomoses of large calibre, the immobile rectum is not so circumstanced. The rectum is supplied chiefly by the superior hæmorrhoidal, which in a high amputation must be tied down and divided before the bowel can be pulled to the required extent. The point of ligation is all-important and should be above the "critical point," where the last of the large anastomotic loops joins with the superior hæmorrhoidal. The artery may be safely tied at any point above this, but below this the anastomotic arrangements are insufficient to ensure against gangrene.

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Specimens were prepared by injection with red oxide of lead and radiographs taken, which are figured in the text. These showed that after ligature below the critical point the vessels of the rectum were filled in a few cases, if care were taken to avoid damage to the finer anastomoses, which is scarcely possible in an extirpation. In most cases they remained quite empty. When the ligature was placed above this point, and even when all the branches of the inferior mesenteric were tied, the whole area could be injected from the superior mesenteric. High ligature of the superior hæmorrhoidal will therefore result in no important disturbance of the nutrition of the rectum, provided the ligature does not include the whole of the meso-sigmoid. This high ligature necessitates a laparotomy, and since the combined abdomino-perineal operation has so far been attended in many cases with fatal collapse, he suggests that the operation be done at two sittings. At the first the superior hæmorrhoidal would be tied and divided, the mesosigmoid cut through from the point of ligature to its junction with the rectum, thus freeing the rectum from above, and the abdomen closed. The extirpation could then be carried out at a second sitting.

G. R. Mill.

REVIEW OF SOME RECENT PAPERS ON PERITONITIS AND APPENDICITIS.

By P. R. Cooper, M.D., B.Sc. (Lond.), F.R.C.S. (Eng.).

Peritonitis and its Treatment.

Berry (J.). *Lancet*, 1907, Vol. ii., p. 675.

For purposes of treatment cases of peritonitis are divided into four classes:—

1. In which there is no perforation of any viscus and no collection of fluid in the peritoneal cavity. The early stage of a peritonitis following an abdominal operation in which no hollow viscus has been opened may be taken as an example. The amount of poison in the peritoneal cavity in such a case is small. Free purgation by salines and the administration of large quantities of fluid either by mouth or rectum, or in some cases by the subcutaneous tissue or even into a vein, is the best treatment. By this means toxins that have already entered the circulation are eliminated by the bowels and kidneys, and the peritoneum is put in the best possible condition for destroying the bacteria which remain. Opium should be avoided. If this treatment fails to arrest the course of inflammation it may be desirable to drain the peritoneal cavity, especially if there is any evidence of free fluid forming there.

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2. In which we know, or strongly suspect, that there is a recent perforation of a hollow viscus, *e.g.*, stomach or intestine. Here immediate operation is indicated with the view of closing the perforation and preventing further extravasation into the peritoneum, *i.e.*, we should aim at preventing rather than curing the peritonitis. The sooner operation can be done the better, although if, for various reasons, this has been delayed until definite evidences of peritonitis have supervened, the case should be considered under classes 3 or 4. As a rule, in cases of the 2nd class free drainage of the peritoneal cavity with as little as possible disturbance of the peritoneum, *i.e.*, by washing, sponging, etc., is the best line of treatment. Purgatives should be avoided at all stages. Nothing should be given by the mouth at first, although in less severe cases perhaps a little water may be permitted. On the other hand, fluid should be given subcutaneously or by rectum.

3. In which there is considerable peritonitis involving much of the peritoneum with more or less tendency to concentration of inflammation in one region. Most of the cases of acute appendicitis with abscess belong to this class, and many of those without abscess. The septic fluid—pus or sero-pus—is more or less localised. There is usually a good deal of distension of the abdomen with rigidity and tenderness, but the latter are more marked at one part of the abdomen. Nausea and vomiting are present if food is taken. The pulse and temperature are probably above normal. The degree of illness of the patient results rather from the amount of absorption taking place from the septic focus than from the amount or nature of the septic material present, *i.e.*, it depends chiefly upon how far the septic material is shut off by means of omentum and adhesions, and how much tension exists. Whilst in some of these cases immediate operation for the removal or drainage of the septic focus may be desirable, there can be little doubt that it is not good treatment in all cases. Probably in the majority of cases, if the patient be properly treated (*i.e.*, avoiding food and purgatives and large enemata and supplying water to the system by slow rectal infusion), the symptoms, after increasing in severity up to a certain point, then recede, as the septic matter becomes more and more localised or is completely absorbed. When localisation has occurred and the patient's condition is more favourable* operation for removal or drainage of the septic focus may be undertaken.

4. In a minority of cases, despite all our care, or in cases that have not been properly treated, the symptoms, instead of improving, continue to increase in severity, and there is little or

* Another reason for delaying operation until "the favourable period" is, that we may by operating during a negative phase still further decrease the opsonic power of the blood and so lessen the patient's resistance to invading germs.

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no attempt at localisation, *i.e.*, the peritonitis is generalised, and purulent material is diffused over the abdomen. This gives the typical clinical picture of " general peritonitis." In these cases extensive operations are to be condemned, owing to their extremely high mortality, the patient usually being in much too enfeebled a state to stand heroic measures. When the patient's condition is extremely bad the Murphy method is the best, *i.e.*, making a small abdominal incision, closing the perforation or removing the appendix, as the case may be, introducing a large drainage tube into the pelvis and placing the patient in a sitting posture, at 35° to 45°, and administering a quart of saline fluid every two hours per rectum or subcutaneously.

Some Practical Deductions from Personal Experience in the Treatment of Appendicitis.

STIMSON (L. A.). *Annals of Surgery*, 1907. Vol. xlvi., p. 122.

THE cases upon which this record is based are as follows:—

Group I. General peritonitis—4 cases.
Group II. Extensive but not general peritonitis—9 cases.
Group III. Local and pelvic peritonitis—15 cases.
Group IV. Closed abscess—22 cases.
Group V. Acute appendicitis—35 cases.
Group VI. Subacute appendicitis—10 cases.
Group VII. Internal operations—3 cases.
Total 98 cases, of which only 1 died.

The main principle of operative treatment has been " to do the least that would probably be sufficient to accomplish the object, whether that were the arrest of a peritonitis or an appendicitis."

In 9 cases in which the position of a palpable mass made approach from the median line advisable, the curved transverse incision with longitudinal separation of recti was employed. In all others McBurney's intermuscular incision was used. The incisions are made as small as the conditions permit but if extra room be required they may be extended into the sheath of the rectum and upwards alongside the rectus for 1 inch or more. Subsequently these supplementary incisisions may be closed with interrupted chronic gut sutures. As soon as the peritoneal cavity is opened the intestines are protected with flat sponges. The finger is then cautiously introduced to determine the situation of the appendix and the general conditions. If the appendix is not accessible without a wide exposure and extensive separation of adhesions, or if the patient be old and his condition grave, simply wiping out the cavity and providing drainage will suffice. In 7 of the cases this was done and in only 2 was any further interference necessary. If the appendix can be readily found and freed it can be ligatured at the base and removed after

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cauterising its interior with the fine Paquelin point. If the finger finds a mass 1 or 2 flat sponges are pressed in and tucked down on the lower side to crowd back the intestines from the iliac fossa, and protect them and the cavity of the pelvis from contamination with pus; then the finger seeks lines of least resistance in the mass and is cautiously pressed onward, usually between the mass and the posterior parietes. As soon as pus is felt and seen it is quickly sponged away and when the flow has ceased the cavity is well dried. The finger is again passed into the abscess cavity to seek the appendix and if found to free it.

Should the appendix be found detached or to have been torn away by manipulations made to free it there is no need to make an extensive search for the stump, it may be left to close spontaneously. This was done in 3 cases without ill result.

Should the pus lie free between the cæcum and abdominal wall or in the pelvis it is carefully sponged out and the area dried.

The writer is strongly convinced of the value of drainage as being a great safeguard and but a trifling inconvenience. As his cases include 13 cases of general or extensive peritonitis with only 1 death they speak strongly for operation. The chief object should be to provide an escape for the exudate and reduce the task of the body in dealing with the toxins and bacilli which it contains. To this end operative interference should be brief and limited to what can be done readily and with the minimum exposure and handling of the intestines, and even, if necessary, to drainage alone.

Acute Diffuse Gonorrhœal Peritonitis.

GOODMAN (C.). *Annals of Surgery*, 1907, Vol. xlvi., p. 111.

THIS is a report of a case successfully operated upon by the writer with a review of the literature of the subject embracing 75 cases. In 30 of these cases the diagnosis was confirmed by autopsy or bacteriological examination. Of the 30 cases 14 died. Operation was done in 20 cases, with a mortality of 4, but 2 of the deaths were probably not due to the gonococcus infection alone.

Ætiology. It is rare, but can exist in the *male*, being due to infection extending along the lymphatics of the cord to the peritoneum. In the *female* it may be a complication of an acute gonorrhœal vulvo-vaginitis—the pus reaching the peritoneum either through the lymphatics or through the ostea abdominalis—or it may result from a ruptured pyosalpinx. (It has been shown, however, that in about 55 per cent. of cases of pyosalpinx the pus is sterile, whilst only about 22·5 per cent. contain gonococci.)

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Symptomatology and Diagnosis. The symptoms do not differ materially from other forms of acute peritonitis. The diagnosis is made by the detection of the gonococcus.

Prognosis and Treatment. It is a serious and frequently fatal malady, especially in children. Although recovery may occur under palliative or symptomatic treatment, operation probably gives the best results in most cases. Even if the patient recovers without operation, a legacy of pus tubes in the female already doomed to sterility, and possibly lasting invalidism, may be left behind. Possibly the discovery of a satisfactory antigonococcic serum might diminish the need for operation.

A very full bibliography is appended.

Peritoneal Tuberculosis.

SYMS (P.). *Annals of Surgery,* 1907. Vol. xlvi., p. 95.

THIS paper gives a very complete review of the literature of the subject since the writer first published his treatment by laparotomy in 1890. "To day," he remarks, "it is as true as ever that laparotomy *per se* will effect a cure in certain cases of tubercular peritonitis, that is to say, this cure is brought about by merely opening and closing the abdominal wall, and to-day we are as ignorant of the reason why this remarkable phenomenon takes place as we were when it was first discovered." We have, however, learned certain limitations for the operation; *e.g.,* (1) it should not be done during the first year of infancy; (2) it is of little use in the adhesive variety of the disease; (3) it should not be performed when the peritoneal trouble is only one phase of a more or less general tuberculosis.

The ideal operation is, however, to remove the original focus of the disease, *e.g.,* tubercular Fallopian tubes, mesenteric glands, vermiform appendix, etc., as if these are left behind recurrence is nearly certain to take place.

The importance of hygienic treatment, *e.g.,* fresh air, etc., must not be overlooked, and this may be given a fair trial before resorting to operation; but there can be no doubt that the introduction of laparotomy, with the removal of the tubercular focus, whenever possible, gives the best results, and in many cases has produced a permanent cure (Mayo).

A full list of references is given.

A case of Spreading Peritonitis cured by Drainage of Pelvis, the Fowler Position, and Rectal Installation of Saline Solution.

WHITEFORD (C. H.). *British Medical Journal,* July 13th, 1907.

THE patient, an anæmic unmarried woman, aged 21, had severe hæmatemesis three years previously, and has since suffered from intermittent dyspepsia. The present illness began with very

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acute pain in the epigastrium three days ago. The pain recurred at frequent intervals, and the patient was repeatedly sick. On examination the abdomen was very distended, universally tympanitic, only slightly tender and chiefly over the epigastrium. Respiratory movement slight. Pulse 115, temperature 99·8°F. No liver dulness in right nipple line, no tumour felt either in abdomen or per rectum. A probable diagnosis of perforated gastric ulcer was made. Operation was performed at patient's house, under ether anæsthesia, with patient in semi-erect posture. A median incision was made above the umbilicus. The stomach, moderately distended and normal, and the transverse colon, enormously distended by flatus, were drawn from the abdomen. On passing the hand towards the pelvis there was a flood of brown, turbid, stinking fluid, the odour resembling that of an appendical abscess. Adherent lymph was seen on the under surface of the colon, the small intestines being distended and injected. The distended colon required puncture and suture in two places before it could be replaced. A rubber tube of ½ in. lumen was passed to the bottom of the pelvis through a supra-pubic incision. The upper incision was closed, without drainage. No attempt was made to wash or swab out turbid fluid. The patient was carried back to bed in a sitting posture and propped up at an angle of 45°, and continuous rectal instillation of warm saline fluid commenced. The patient quickly rallied. The saline intillation was kept up for three days. By the fifth day the pulse was 100 and the temperature 98°. The distension completely disappeared. The wound was healed by the twelfth day.

The writer thinks it probable that the infection originated in the appendix. He attributes recovery to (1) the shortness and simple nature of the operation for establishing drainage; (2) the Fowler position, and (3) the rectal instillation of saline fluid; further, he considers that the patient's chances of recovery would have been greatly diminished by removal to a nursing home or hospital.

The Diagnosis and Treatment of Appendicitis.

BROOK (W. H.). *British Medical Journal,* July 13, 1907, p. 67.

THIS writer classifies cases of appendicitis as follows:—

1. *Catarrhal appendicitis, i.e.,* is confined to the single layered epithelium of the tubular glands of the appendix, which, however, becomes shed in places, thus opening the door for infection of the deeper tissues.

2. *Ulcerative appendicitis, i.e.,* in which not only is the epithelium shed, but the mucous and submucous coats are opened up. The mischief may stop here and the patient recover, but with a damaged or strictured appendix which may later become cystic and undergo re-infection and rupture.

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3. *Appendicitis* (with or without perforation) and *abscess.* This may be (*a*) an abscess pointing through the abdominal wall, (*b*) an abscess in the peritoneal sac more or less shut off by adhesions, (*c*) an abscess outside the peritoneal sac, creeping up behind the ascending colon, (*d*) an extension of suppuration *upwards* along outer side ascending colon and kidney towards liver, diaphragm and even to pleura, or *downwards* into pelvis, (*e*) a general suppurative peritonitis.

4. *Fulminating appendicitis,* i.e., where the inflammation and toxæmia are so intense that patient, if unrelieved, frequently dies within 48 hours of onset.

His conclusions with regard to treatment are:—

(1) The majority of cases of acute appendicitis will get over the attack if treated on simple medical lines, *i.e.*, if kept absolutely at rest, given nothing by mouth for first 24 hours, and then only simplest food such as albumen water or Brand's essence and water until symptoms subside, avoiding purgatives and enemata, applying hot fomentations locally, etc.

(2) During the quiet period the appendix should be removed.

(3) During an attack the patient should be carefully and frequently watched, and on any sign of fulmination operation should be done at once.

(4) If suppuration occur, and all is going on well otherwise, examination should be deferred until after the fifth day, care being then taken not to open the general peritoneal cavity. But in all cases of doubt pus may be evacuated at once. If the appendix present in the wound it should be removed, but no elaborate search should be made for it. It may be removed later.

(5) In general suppurative peritonitis drainage, massive infusions and calomel should be relied upon.

One Year's Work in Acute Appendicitis.

BURGESS (A. H.). *British Medical Journal,* July 13th, 1907, p. 70.

THIS is a report upon 47 operations for acute appendicitis, all performed in 1906. The cases are grouped as follows:—

Group.		Deaths.	Mortality.
1. Early cases	6	0	0
2. Abscess cases	19	2	10·5%
3. Diffuse spreading peritonitis...	19	0	0
4. General peritonitis	3	2	66·6%
Total	47	4	8·5%

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The writer contends that the mortality from acute appendicitis is still too high, and that *early removal of the infected appendix is the only means we have of reducing it to a minimum.* "Appendicitis," he states, "is undoubtedly at first a purely local disease; it is absolutely limited to the appendix. . . . . If the appendix is removed at this localised stage the process is cut short, and all possible dangerous consequences of delay avoided. Operation at this period is as safe as an 'interval' operation—that is, it has a mortality which is practically negligible; it is, moreover, easier of performance, since there are no firm adhesions such as are frequently found at an operation during the quiescent period. The convalescence is short, drainage, even if necessary, is only so for a few days, and the risk of subsequent weakness of the scar is extremely slight." Again, "In the early stages of an attack of appendicitis there are no signs by which we can foretell with any degree of confidence whether the infection will remain limited to the appendix and so subside without operation, or whether it will spread to the peritoneum and operation subsequently become inevitable. In many cases by the time it is certain that it *is* spreading and *will* necessitate operation it is only too evident that the chances of recovery are against the patient."

"Operation in the stage of local abscess does not possess a single advantage over that carried out in the early stage where the infection is limited to the appendix, but has several well marked disadvantages—the mortality is greater, not so much on account of the operation *per se*, but because of the greater toxic state of the patient; convalescence is more prolonged; the appendix is in many cases left behind, and unless it has completely sloughed away may cause a persistent sinus, or may give rise to further attacks of the disease; the drainage necessary, often for several weeks, leaves a weak scar, and predisposes, therefore, to hernia; and the numerous adhesions inevitably left after an appendicular abscess has formed may be a source of permanent discomfort, and may also be a cause of intestinal obstruction at a later date."

In cases of spreading peritonitis the writer is no advocate of waiting for the formation of limiting adhesions; he remarks, "the mortality increases directly with the length of time that has elapsed before operation is undertaken. By means of strips of sterilised gauze the infected area can be safely packed off from the rest of the peritoneal cavity, and this can be done at least as readily in the early as in the later days. Delay merely increases the general toxæmia and lessens the chances of recovery. Moreover, the more one trusts to natural adhesions forming the less one would be willing to disturb them by searching for the appendix, and, consequently, it becomes increasingly more and more probable that the appendix—the primary source of the infection—will be left behind."

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In the writer's 19 cases (group 3) the appendix was perforated or gangrenous in all. He first removed the appendix, then flushed the peritoneal cavity with sterile saline solution, arranged for drainage, and kept the patient in the Fowler position for 48 hours. All recovered. In "subsiding" cases the writer would not operate. Also, he does not favour the "interval operation"; he thinks if a patient has weathered an attack of appendicitis without operation he should be given the benefit of his victory, but should another attack occur he would of course operate in the early stage.

The Treatment of Complications and Sequelæ of Gastric and Duodenal Ulcers.

THOMAS (J. L.). *British Medical Journal*, July 13, 1907, p. 72.

THE complication here chiefly dealt with is *perforation*, and the writer lays down the following rules for treatment pending operation or even in lieu of operation:—

1. Place the patient at rest in the horizontal position.
2. Administer morphine (hypodermically) in sufficient doses to relieve pain and to check peristalsis.
3. Avoid palpating and manipulating the abdomen.
4. Empty the stomach by means of a stomach pump (ordinary siphonage is insufficient to remove the solid contents of the stomach); this may be done under anæsthesia.
5. Give neither food nor drink by the mouth.
6. Water and food may be given per rectum.
7. Cover the abdomen with a thick layer of cotton wool and bandage it. On no account blister the abdomen.

The writer is of opinion that "conservative surgery of a very high order can be performed by the peritoneum and omentum under favourable conditions."

If perforative peritonitis has already occurred and the patient is in extremis the writer simply mops out the gastric contents from the abdomen, drains and washes out the stomach, and, if possible, sutures the perforation, but he believes in operating quickly and doing as little as possible. He has quite given up the practice of flushing out the abdomen with saline solution, and considers evisceration barbarous and unscientific.

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Pathology.

The Pathological Anatomy of Acute Anterior Poliomyelitis.

HARBITZ (F.) and SCHEEL (O.). *Norsk Mag. f. Laegevidensk.*, 1907, p. 1145.

IN this important article the authors give a résumé of their work on acute anterior poliomyelitis and some associated diseases in Norway, 1903—1906. In 1905 there were 719 cases, with 111 deaths; in 1906, 334 cases, with 34 deaths. The authors have made elaborate examinations of the brain, cord and pia mater, in 13 cases of acute poliomyelitis fatal in 2—10 days, 4 of acute poliomyelitis followed by death in from six weeks to $22\frac{1}{2}$ months, and 2 of acute encephalitis occurring in the course of epidemics of acute poliomyelitis. In each case sections were cut and examined from between 30 and 50 separate pieces of the cord and brain, and the peripheral nerves (lumbar and brachial plexuses) were also examined; the condition of the pia was also compared with that found in tuberculous and cerebro-spinal meningitis.

The general result of the post-mortem examinations was negative; the spleen was little enlarged, there was no parenchymatous degeneration, no ecchymosis, none of the acute inflammation of the serous cavities noted by some other writers. Nothing was found indicating that the gastro-intestinal tract (except in one case), or the nose or throat, had been the primary source of infection; as most of the patients died 7—9 days after the onset of the disease, however, it is possible that a slight initial sore throat had cleared up by that time, and the authors think the throat the likeliest channel of infection. In a few cases pneumonia was found as a complication. Examination of the nervous system showed that the disease is due to spread of an infection from the pia mater along the vessels into the nervous tissue. The vessels are seen to be surrounded with small round cells like lymphocytes, in both pia and white matter; in the gray matter the inflammation is more diffuse, and extends further from the vessels, and the inflammatory cells here include numerous polymorpho-nuclear leucocytes. The vanishing ganglion cells are invested or even replaced by leucocytes; the inflammation was often hæmorrhagic in character. The extent to which this inflammatory process attacks the nervous system is far greater than the clinical symptoms of the cases would suggest. Serial sections showed that an inflamed area in the cord always corresponded to a directly connected leptomeningitis;

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but either the pia alone might be inflamed, or the pia, the vessels, and the ganglion cells, might all be implicated together. The anterior cornua are most gravely involved only because they are the most vascular part of the cord; their ganglion cells may show degenerative changes very early in the disease. The extensive initial leptomeningitis explains the headache, vomiting, generalised pains, and stiffness of the neck and back, often recorded at the beginning of an attack of the disease, and forming the whole story of the abortive attacks of it so often seen in epidemics of acute anterior poliomyelitis.

Macroscopically, the pia over the cord, medulla and brain is markedly hyperæmic, but not obviously inflamed, and never purulent. Microscopically, however, the inflammation of it is manifest over the cord, medulla, pons, cerebellum (particularly its median parts), the base of the brain, the Sylvian fossæ, and sometimes even over the hemispheres as well—the central, frontal and mesial gyri. Corresponding inflammation of the underlying nervous tissue is everywhere found; it is very conspicuous in the gray matter about the fourth ventricle and the neighbouring ganglia, everywhere dipping in with the vessels from the pia mater; the white substance is much less affected than the gray. In a general way the inflammation was less acute in the medulla and pons than in the cord, though still hæmorrhagic in places; the floor of the fourth ventricle was œdematous in the severest cases. The cerebellar tissue was comparatively little inflamed, excepting where it joined on to the medulla and pons. The basal ganglia, on the other hand, and internal and external capsules showed fairly constant inflammatory infiltration, mostly confined to the vessels, and with little ganglion-cell degeneration. The cerebral cortex often showed some inflammation, chiefly about the walls of the Sylvian fossa. As the remains of similar changes to those described above were found in the four milder non-fatal cases af acute poliomyelitis dying of other complaints, it cannot be argued that such extensive inflammation of the nervous system is only seen in the acute fatal cases of the disease.

The authors remark that the name "acute poliomyelitis" remains a good clinical term for the disease, although it is not pathologically satisfactory. As regards diagnosis, in a few cases of anterior poliomyelitis the course of development of the disease may simulate Landry's ascending paralysis. Other cases, in which the medulla and bulb are most affected, may imitate acute bulbar paralysis, with marked dyspnœa, cyanosis, difficulty in masticating, swallowing and speaking, and paralysis of the palate, face or eyes. Yet other cases, with, *e.g.*, a large localised hæmorrhagic patch of inflammation, may present the clinical picture of an acute transverse myelitis; others may be just like cases of peripheral neuritis, though the authors never found any sign of acute interstitial infiltrating neuritis in their 19 autopsies. As already remarked, they always found microscopical

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evidence of more or less encephalitis—or rather meningo-encephalitis—and one of their patients, dying on the 13th day, with fever, headache, vomiting, stiffness of the neck, cramps, mental dulness, rigidity of the limbs, and finally coma, but without any paralysis or paresis, had the afore-mentioned changes in cord, medulla and brain, and much most marked in the brain; hence acute poliomyelitis may simulate acute encephalitis clinically. The authors could find no anatomical basis for connecting acute poliomyelitis with cerebro-spinal meningitis; in this disease the leptomeningitis is purulent, and the invasion of the underlying nervous tissue is very slight; and they note that cases of cerebro-spinal meningitis do not seem to occur in epidemics of acute poliomyelitis, and vice versa, except in America.

Discussing the ætiology, the authors are sure that some single microbe must cause the epidemics of acute anterior poliomyelitis, but though they searched and stained for it carefully, they could find no microbes in sections of any of their 19 cases. Geirsvold (1905) found a meningococcus-like diplo- or tetracoccus in the cerebro-spinal fluid of 12 patients with acute poliomyelitis, and this coccus was also found in the cerebro-spinal fluid of 3 patients who subsequently figured among the authors' 19 autopsies. The authors note that Weichselbaum's meningococcus soon ceases to be stainable in the nervous system, and is often entirely so if many hours elapse between death and the obduction. The microbe of acute anterior poliomyelitis gains access to the pia mater probably by the blood, possibly by the lymphatic system, from the throat or intestine, just as (most likely) that of cerebro-spinal meningitis does. Fourteen good coloured drawings illustrate the microscopical morbid anatomy of acute poliomyelitis.

A. J. Jex-Blake.

On the Reversion of Carcinoma to the type of Adenoma, experimentally produced in mice.

Apolant (Prof. H.). *Münch. med. Wochenschr.*, 1907, 54 Jahrgang. No. 35. S. 1720.

In contradistinction to the extreme variability in structure and to to the transition of pure adenoma to carcinoma, etc., so commonly met with in tumours which arise *spontaneously* in mice, and to which attention has been drawn in a previous communication, the author finds that tumours produced by *inoculation* retain their original form with extraordinary persistence through many generations. In time, however, if the number of generations through which the tumour has been grown is a high one, there is a gradual tendency for the growth to assume the type of a solid reticular carcinoma commonly formed of anastomosing

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columns of cells, which show only here and there an " acinous " arrangement. The author formerly held the view that the rate of growth was the all important factor governing the type of structure of these tumours, slowly growing forms being probably papillary in structure, rapidly growing forms being solid and reticular, and that the transition in type was to be attributed to an increase in virulence. But from his more recent experiments the author is convinced that this is not the case and he now holds that the type of structure of such tumours is dependent upon biological changes in the organism of the animal host.

Examinations were made of a large number of tumours derived from one stock, which for fifty generations had reproduced the picture of a solid reticular carcinoma and which at the present time has grown in the same form in the sixty-fourth generation. In many of these growths the author saw typical adenomatous structures either throughout the whole piece examined or scattered through it in different spots, as well as areas which might be looked upon as transition forms between carcinoma and adenoma.

This remarkable and sudden change of a malignant carcinoma into a simple adenoma was only met with in animals which by one method or another had been partially immunised.

Tumours from animals previously treated by the immunisation methods of Ehrlich and Bashford were examined. Among those from the first series (Ehrlich's method), there were three showing an adenomatous structure. As the experiments in these series were made for another object the tumours were originally preserved for macroscopic purposes only and were, therefore, not suitable for fine histological study. The author consequently does not give exact figures as to the percentage of cases of adenoma in the series. The type of experiment is illustrated by the following: A mouse was inoculated with a virulent carcinoma. On the following day it received an immunising injection of a non-virulent tumour which had originated spontaneously. The tumour primarily inoculated was removed 6 days after the last injection and was found to show no " acinous " structure. A local recurrence took place at the site of removal and grew very slowly. Twenty days after the last operation the recurrent growth was removed and a further inoculation with virulent growth made, which produced a slowly growing tumour. This tumour as well as the recurrent growth both proved to be of adenomatous structure.

The explanation of these phenomena is that as the animal acquired immunity gradually, the growth of the first tumour was not influenced because a sufficient degree of immunity had not developed. The recurrent growth and the tumour resulting from the second inoculation on the other hand were modified

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because the degree of immunity had by that time become much higher.

In the second series 27 tumours were examined the animals having been immunised by injections of blood. Two of the animals were treated with rabbit's blood, 4 with rat's blood, 5 with guinea-pig's blood, and 16 with mouse blood. In only those animals treated with mouse blood was there any alteration in the subsequent structure of the growths. In 4 of these 16 tumours was the structure distinctly "acinous." The 16 tumours were distributed over 4 series of inoculations, 8 belonging to the first set, 3 each to the second and third, and 2 to the fourth. The 4 adenomatous tumours were found as follows: 1 among the first series of 8, 0 among the second series of 3, 2 among the third series of 3, and 1 among the fourth series of 2—the percentage being much higher in the later series.

The importance of these results lies in the fact that they supply the exact counterpart to what is seen in the progressive development of adenomatous tumours into carcinoma—a change hitherto attributed to removal or loss of restraint or more generally to lack of tissue resistance. In the author's opinion these experiments show that by immunisation methods the lost tissue resistance can be restored and that in consequence a cancerous growth can be made to revert to a simple and benign form. They further serve to emphasise the error of drawing a hard and fast line between adenoma and carcinoma.

R. S. TREVOR.

Hypernephroma.

BLACKBURN (I. W.). *New York Med. Journ.*, 1907, lxxxvi., p. 285.

THE author publishes three cases of hypernephroma and one case of papillary adenoma of the kidney, the histological features of each being admirably illustrated. The four tumours were found unexpectedly at autopsy and were the only primary renal growths discovered in 2,200 post mortem examinations.

The general characters of the hypernephromata are described as follows: (1) They may be both malignant and non-malignant, though probably all are potentially malignant, or at least metastatic. When malignant, the growths appear to belong to a class of their own and cannot be included among the sarcomata or carcinomata.

(2) They lie beneath the capsule of the kidney, the capsule over the tumour being continuous with that of the kidney.

(3) The surface of the growth is usually nodular, yellowish white in colour and mottled with hæmorrhages.

(4) On section the tumour is separated from the kidney

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substance by a connective-tissue capsule from which fibrous septa penetrate the growth and divide it up into numerous oval and rounded alveoli.

(5) The cut section of the growth resembles the external surface, even in being sometimes nodular. The latter areas may show foci of softening.

(6) The adjoining lymphatic glands are seldom affected by metastasis. The most frequent sites of metastasis are the liver, lungs and bones, and the conveyance is by means of the blood vessels.

(7) The growth is prone to penetrate the renal pelvis and the renal vein.

The general histological features of these growths are:—(*a*) The resemblance of the tumour cells to those of the adrenal. (*b*) Absence of transition structure between the tumour and the renal tissue; present in the renal adenomata. (*c*) The presence of a thin-walled capillary network among the cells of the growth thus lresembling the structure of the adrenal gland. (*d*) The presence of large clear more or less columnar cells, arranged in irregular rows along the alveolar walls or in direct contact with the endothelium of the capillary network. (*e*) In some forms an alveolar structure with open gland-like acini, sometimes containing free cells and blood, with a stroma consisting of delicate connective tissue and capillaries lined with low columnar cells.

In none of the three cases of hypernephroma were there any clinical symptoms of the tumour. In the first case, however, an examination of the urine about a month before death revealed the presence of blood and casts.

In Case 1 there were metastases in the liver, and in Case 3 in the right suprarenal body. This case is also interesting because the tumour lay in the lower pole of the kidney and also because the left supra-renal was tuberculous.

All three tumours occurred in men aged 63, 68, and 77 respectively. In two the right kidney was affected and in one the left.

The papillary adenoma of the kidney was found in the body of a man aged 48. The tumour was small and white; it projected from the surface but lay beneath the renal capsule and appeared to be somewhat distinctly separated from the kidney substance. The growth was made up of a delicate connective tissue stroma forming large alveoli into which papillary outgrowths had penetrated in great profusion. The stroma carried the blood-vessels and in each papillary process was a delicate capillary. The cells were tall and columnar in shape, and were separated from the capillaries in the papillary processes by a layer of connective tissue. No transition forms between kidney

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substance and the cells of the tumour could be made out. The author regards this as an example of what Ziegler has described under the name of *adenoma renum tubulare papilliferum.*

R. S. TREVOR.

The Aetiology and Pathology of Echinococcus Alveolaris.

TEUTSCHLAENDER (O.). *Correspondenz-Blatt für Schweizer Aertze,* xxxvii. Jahrg., 1907. Ss. 406, u. 433.

THE writer reports fully two cases of this disease, and adds brief notes of a third.

The first case was that of a man aged 78, in whom the lesions were confined to the liver, which was found post-mortem to contain two groups of confluent nodules containing colloid material. One group lay at the bottom of a deep furrow on the surface of the organ and had calcified walls; the other group was found in the liver substance, and was soft and honeycombed on section. The mucosa of the stomach and duodenum was very injected.

The second case was that of a man aged 36, in whom deposits were found in the brain, lungs, liver and right suprarenal. There were two masses in the left cerebral hemisphere, forming together a lump the size of a small apple. On section these consisted of a firm stroma in which were numerous holes containing a jelly-like material. The lung nodules varied in size from that of a tangerine orange to that of a hazel nut, and some of them showed on section three differently coloured zones—a yellowish, semi-caseous centre, a middle red vascular zone and outer deep violet ring composed of altered lung tissue. Several of these nodules contained cavities. The liver was much enlarged, the right lobe being almost entirely replaced by a firm nodulated mass the size of a man's head. This mass on its posterior surface was continuous with a growth the size of two fists occupying the region of the right adrenal of which no trace could be found. On section it was found that a large pus-containing cavity in the liver tumour extended through a firm layer of connective-tissue originally separating the liver from the adrenal tumour into the latter. The main bulk of the two tumours was of identical structure, and consisted of a dense stroma in which were many loculi, giving the whole a spongy character. The left lobe of the liver contained a similar much smaller mass.

Microscopical examination of tissue from the various tumours confirmed the diagnosis of echinococcus alveolaris. Scolices were found only in the brain tumours and in the small liver tumour in Case ii. In both cases chitinous membrane was found in abundance, in many instances embedded at the periphery of the foci in a richly cellular tissue containing giant cells. In the

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first case the lesions stood in close relationship with the blood-vessels, especially the veins, in one of which chitinous membrane was also seen.

The author discusses in some detail the nature of the supra-renal tumour, the diagnosis lying between (1) adrenal tumour, (2) tumour of the supra-renal body, (3) multilocular echinococcus of the supra-renal. No trace of supra-renal tissue could be recognised either by the naked eye or under the microscope. The mass as a whole had the shape of an enormously enlarged supra-renal presenting three surfaces, an anterior in relation with the liver, a posterior in relation with the diaphragm and a lower with the kidney. Above and to the right the mass was continuous with and inseparable from the liver, whilst below and to the left it was partially separated from the latter by a deep furrow. The inferior vena cava and the gall-bladder lay in front of the growth, the former being much compressed by it. The right supra-renal vein was present, although much compressed and partially obliterated, whilst its opening into the posterior wall of the inferior vena cava appeared relatively large. The presence of this vein is held as proof that the supra-renal body must have originally been present. A probe passed into the vein entered into a depression resembling a hilum on the anterior surface of the mass, and could be followed further into the depths of the tissue.

The shape and relations of the tumour as well as the relation to it of the right supra-renal vein, force the author to conclude that the mass is a much diseased supra-renal body, diseased, that is to say, by the growth *within* it of the echinococcus parasite, not merely destroyed by compression from without.

The author states that only two other cases of echinococcus alveolaris affecting the supra-renal body have been published (Huber-Friedreich,[1] Elenowski [2]). In both of these the right adrenal was affected, and both occurred in men, and in both the supra-renal was the only organ affected, and therefore, presumably, the primary focus of the disease. In the case described the lesion appears to have been secondary, and produced, according to the author, by direct spread from the liver, not by retrograde hæmatogenous infection *viâ* the vena cava. The foci in the brain and lungs are considered to be due to infection by the blood-stream in view of the fact that the liver tumour had burst into the vena cava in several places; but in spite of this the author thinks that the fact that the liver is the site of election for this disease, the size of the liver tumour and its intimate connections, common cavity and similar structure

1. *Huber:* Zur Kasuistik der Addisonkrankeit. D. Archiv für klinische Medizin. 1868 Band 4 pag. 613. 1869 Band 5 pag. 139.

2. *Elenowski:* Supplement zur Chirurgie. 1904 Band 15, Nr. 85, Jan. pag. 5.

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with that of the adrenal growth make the view of direct spread in the latter case more likely.

It is considered that the parasitic embryos escaping from the alimentary canal are carried by the portal vein into the capillaries of the liver where their retention may be especially favoured by such conditions as the furrows mentioned in Case i. The author inclines to the view that in Huber's and Elenowski's cases the parasites reached the supra-renal through the liver, especially as in both the right capsule was the one affected.

The clinical histories of the two cases showed that both men came from the immediate neighbourhood of Wil, in the Canton St. Gallen, the home of one of them being also close to the border of the Canton Thurgau. From the literature seven other cases coming from these two Cantons have been described.

Both cases supported the statement that the disease is commoner in men, and after the 30th year. Both men had had to do with cattle, the first case being that of a farmer and cattle-owner, the second being employed for a long time at the asylum at Wil in looking after oxen—a point in favour of Posselt's view that man is infected either by cattle or by some unknown cause common to both.

The third case referred to was one from the post-mortem records of the Wil Asylum for the year 1892. The liver in this case contained a very extensive mass, and there was also tuberculous peritonitis. Any symptoms referable to the liver could be equally well explained by the tuberculous peritonitis. There was no jaundice. The point of interest in the case was that in the year 1873 a note was made that the liver extended one finger's breadth below the rib-margin.

Case i. presented the typical picture of senile dementia. There were no symptoms referable to the liver.

Case ii. was admitted to the asylum with the tentative diagnosis of general paralysis. Later on the onset of frequent vomiting, headache, vertigo, right-sided paresis, apoplectiform attacks with disturbances of speech, etc., and gave rise to a suspicion that the case was one of cerebral tumour. Unfortunately no note was made as to the condition of the fundus oculi. The cerebral condition completely overshadowed any symptoms that might have been due to the tumours in the liver and adrenal, and no note was made even of any lesion in the lung. There was no pigmentation of the skin. Both cases had attacks of profuse sweating, a symptom mentioned as frequent in this disease, but hardly a distinctive one.

The author is of the opinion that disturbances of the alimentary canal, which are frequently met with in these cases, are not perhaps merely the result of the infection, but that they may play some part in the ætiology of the disease by predisposing the individual to the infection by depriving him of the

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protection afforded by a healthy mucous membrane and healthy secretions.

Cases ii. and iii. show that the disease is a very chronic one, lasting for 10—20 years. The author entirely disagrees with Posselt, and finds that enlargement of the spleen is not constant and bears no constant relationship to the size of the liver.

R. S. TREVOR.

Phagocytosis in Sputum as a Measure of Resistance of Tuberculosis.

ALLEN (A. H.). *New York Medical Journal,* June, 1907.

HAVING proved that phagocytosis does take place in sputum, Dr. Allen finally concludes that phagocytosis in ordinary sputum examination is of little value in prognosis, to be of any value it would seem that a specimen from the homogenized daily output would be necessary. He asserts that it does not show positive and negative phases with tuberculin reactions and that it does not vary with the presence of bad symptoms, but he is of the opinion that the subject deserves further study.

ARTHUR ROBINSON.

A study of the effects and of the fate of Sutures in Wounds of the Kidney.

BARCHI (E.) and TADDEI (D.). *Lo Sperimentale,* Anno lxi, Fasc iv.

IT has at times been stated that it was inadvisable to introduce sutures into the kidney inasmuch as they were apt to produce necrosis and to give rise to the formation of calculi. If this were in reality the case it might be more advisable to remove the kidney after certain cases of injury rather than try to preserve it. With the object of gaining some definite information on these points Profs. Barchi and Taddei have made a series of experiments on dogs and rabbits. The experiments on the rabbits were unsatisfactory probably on account of the special difficulties which are met with in operating on their kidneys, but the results of the operations on 8 dogs were entirely in favour of conservative surgery. The dogs were killed at intervals after the operation varying from four days to two hundred and fifty-five days, and although here and there there were signs of local necrosis due to pressure of the ligatures, it was of slight extent and produced no bad results. The sutured wounds in the renal substance healed perfectly and the sutures, silk and catgut, though still present, were the cause of no irritation—they were infiltrated with cells and were probably in process of disintegration.

ARTHUR ROBINSON.

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Therapeutics.

Serum Treatment of Bacillary Dysentery.

VAILLARD et DOPTER (M. M.). *La Presse Médicale*, 1907, No. 45.

THE writers have been working since 1903 with a serum obtained from the horse. In experimental dysentery in animals this serum proved to have antimicrobic and antitoxic qualities and to be both preventive and curative in action. They now present the results of its employment in cases of microbic dysentery, with recommendations as to dosage and mode of employment. The chief effects noted are:—

1. A reduction of mortality where the serum has been systematically employed. Excluding failures due to the hopeless condition of the case and also cases of asylum dysentery, there were out of 296 cases (including 127 grave cases) 5 deaths—a mortality of only 1·6 per cent.

2. Almost immediate relief of suffering and rapid recovery. Improvement begins a few hours after the injection, pain and tenesmus subside and, except in very severe cases, almost disappear in the next 24 hours. Melaena ceases and the frequency declines rapidly, and often 48 hours after the first injection the stools become less slimy and assume a fæcal character. The general state and toxic symptoms are influenced no less rapidly, and vomiting and hiccough rapidly cease. The duration of the disease is much reduced. Cases of average severity are controlled in 36 to 48 hours, and severe cases if taken in time recover in 5 or 6 days. In cases in which the intensity of abdominal symptoms and signs of intoxication presaged a fatal issue, recovery has been brought about in 10 to 15 days. Convalescence is also shortened.

Its action is more rapid and decisive the earlier it is employed, and the ultimate severity of any case cannot always be foreseen. The dose will vary with the case and more than one injection may be necessary. Full doses may be given without ill effects.

In adults, early cases of medium severity received 20 c.c., repeated if no improvement is noted after 24 hours. In more severe cases or cases which have been running for several days a third may be necessary. In severe cases 40—60 c.c. repeated the following day, and, if not enough, continued in decreasing doses till the stools become infrequent. In the most severe cases massive doses must be given at first, 80—100 c.c. in two portions in the course of the day, and the serum continued in decreasing doses till the intestinal symptoms abate. In children these doses are reduced by half.

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Relapses occur exceptionally after the tenth day following the last injection. Urticaria, etc., following the injections may be avoided or diminished by giving 2 to 3 grammes of chloride of calcium on the day of the injection and two following days. As a prophylactic an injection of 10 c.c. gives a temporary immunity lasting 10 to 12 days.

G. R. MILL.

A case of Lupus of the Larynx successfully treated by the external application of X-rays.

TURNER (A. LOGAN). *Edinburgh Medical Journal,* Sept., 1907.

A GIRL, æt 13, was sent to the writer for huskiness of voice. The previous history was that when five years of age the patient had a tuberculous gland under the chin which discharged several months. When seven years old her parents noticed that the skin of her nose was becoming discoloured, a little later there was some destruction of the skin and she was then admitted to the Skin Department of the Royal Infirmary where her condition was diagnosed as lupus. For the next three years she had X-ray treatment with a very satisfactory result.

About a year before coming to the writer it was noticed that following an attack of influenza her voice was becoming husky.

On examination the skin over the nasal cartilages presented a white cicatricial appearance but no broken surface. No sign of lupoid infiltration in the nose, naso-pharynx or in the buccal mucosa.

Laryngeal examination showed the epiglottis to be infiltrated along its upper border, which was also irregular showing one well marked notch.

The mucosa covering the arytenoid cartilage, was infiltrated, the true cords were thickened and irregular in outline, there being a nodular infiltration limited to the posterior parts of the cords. No signs of any pulmonary disease.

Prior to the publication of a paper by Birkett it was generally supposed that any application of X-rays through the cartilages of the larynx would be followed by no curative effect and would be attended by great risk of irritating the skin.

The X-rays were applied through a focus tube, over the skin of the left side, middle line and right side of larynx at consecutive sittings. There were three sittings a week and these were carried out for a year. Each application lasted from five to ten minutes. The patient now had no hoarseness but a clear and strong voice. The mucous membrane covering arytenoids and cords presented a normal appearance and the epiglottis was firmly cicatricial.

LINDLEY SEWELL.

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Opsonins and Vaccines as applied to Surgical Therapy.

BERGEY (D. H.). *Univ. of Pennsyl. Med. Bulletin,* June, 1907.

IN his short but very interesting paper Dr. Bergey gives an excellent summary of the present-day knowledge of anti-bodies, which he groups in the following classes: antitoxins, agglutinins, precipitins, bactericidal amboceptors and opsonins. Dr. Bergey points out that in the group of diseases produced by agents which have the power of secreting soluble toxins the antitoxins are the most useful methods of defence, and he asserts that diphtheria and tetanus are the only diseases of human beings against which efficient antitoxic sera have been provided.

In typhoid, dysentery and Asiatic cholera the causative bacteria secrete soluble toxins, but the poison they produce is intimately associated with their body proteids, and the anti-body in these circumstances is a bactericidal amboceptor, of which one of the haptophore groups unites with the bacteria, and the other with the complement of the blood, producing a condition in which the destruction of the bacteria occurs. In these cases also the blood acquires a high agglutinating power, which is an important factor in the defensive action.

In diseases due to streptococci, staphylococci, pneumococci and bacterium tuberculosis, and in Malta fever, plague, gonorrhœa, cerebro-spinal fever, and anthrax, the blood serum does not acquire either high antitoxic, bactericidal or agglutinating power, and in these circumstances the opsonins are the most important anti-bodies yet discovered.

In the concluding part of his communication the author states that the diseases amenable to treatment by bacterial vaccines intended to raise the opsonic index of the patients are furunculosis, carbunculosis, circumscribed suppurating inflammations due to streptococci or pneumococci and localised affections due to bacterium tuberculosis, and he advises the use of massage during the treatment with the object of facilitating the more active penetration of the infected area with body fluids carrying the specific opsonin. He also suggests that measures calculated to induce passive hyperæmia of the diseased part may prove useful, and he advises the use of bacterial vaccines in surgical practice, when, from the nature of the case, satisfactory aseptic and antiseptic measures cannot be carried out.

ARTHUR ROBINSON.

An "Asthma Cure."

EINHORN and SCHAEFER. *Muench. med. Wochenschr.,* Nos. 27 and 28, 1907.

EINHORN undertook, at Schaefer's request, an analysis of the patent medicine known as "Dr. Tucker's Asthma Cure." This is a secret remedy originating in America which has rapidly

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gained in favour among sufferers from asthma and which has proved itself surprisingly effective in the control of spasmodic attacks in that disease. As in the case of other secret remedies the price of the article is probably out of all proportion to its cost and it is much to be desired that the profession should have at their command an equally effective remedy of known composition.

Several previous analyses have been published.

Aufrecht (Pharmaz. Ztg., 1903) found

Cocaine Hydrochloride	1 %
Potassium Nitrate	5 %
Glycerine	35 %
Bitter Almond Water	30 %
Water	25 %
Plant extractives	4 %

Bertram (Zentralbl. f. innere Med., 1905) found

Atropin	0·856 %
Nitrous Acid	2·683 %
Sodium	1·314 %
Residue on drying...	5·52 %
Residue on incineration	4 %

and in addition glycerine, water, and sulphuric acid.

Anselmino (Pharmaz. Zentralbl. Halle., 1906) believes that the composition of the mixture varies; one sample analysed by him contained prussic acid and probably also cocaine, while another contained no prussic acid, but nitrate, and certainly also atropin in addition to cocaine.

Einhorn, in a number of different samples, never detected prussic acid. According to his analysis the mixture consists of

Cocaine...	1 %
Nitrous acid	2·6 %
Glycerine	30 %

in addition to water, inorganic salts, and extractives which are probably of vegetable origin. He was unable to isolate atropin, but showed by physiological experiment that it exists in the mixture. Einhorn made inhalation mixtures containing cocaine 1 %, varying quantities of atropin and sodium nitrite, and the corresponding amounts of glycerine and water. The clinical results with these were not encouraging. Only in a few cases were the spasmodic attacks controlled. He then prepared in a pure crystalline condition the nitrites of cocaine and atropin. A mixture of these salts of the following composition,

Cocaine nitrite	1·028 %
Atropin nitrite	0·581 %
Glycerine	32·16 %
Water	66·23 %

when used with a fine spray apparatus for inhalation, gave

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very satisfactory results, quite equal to those obtained by the Tucker "cure."

Schaefer gives an account of three years experience of the Einhorn mixture in the treatment of twenty to thirty asthmatics. Many of these had previously used the Tucker cure and some used it afterwards for comparison. There appears to be practically no difference in the results. Schaefer also discusses the proper mode of applying the inhalations, and the question of the possibility of an overdose. Of this he thinks there is little danger and the great relief given to the asthmatic more than counterbalances what little risk there is of harm from the drugs.

The Einhorn mixture can be obtained from Dr. Albert Bernard, Einhornapotheke, Berlin, Kurstrasse 34; a suitable spraying apparatus is supplied by the same firm.

E. M. BROCKBANK.

Veronal Poisoning.

ANDERSSEN (J.). *Norsk Mag. f. Laegevidenskaben*, 1907, p. 1217.

VERONAL was introduced in 1903 by E. Fischer and von Mehring, and has been much used as a hypnotic in nervous cases, insanity, and delirium tremens. The general dose for a woman is 5—7 grains, for a man 8—12 grains, and for rectal administration 12—25 grains dissolved in warm milk; these quantities may be increased in mental cases or delirium tremens up to 15—60 grains in the twenty-four hours. But doses of 15 grains or more may produce fever, headache, dizziness, vomiting, exhaustion, and skin eruptions—morbilliform, urticarial, even pemphigoid—with much itching and followed by desquamation. The fatal dose for adults seems to be about 150 grains or more; veronal is rather slowly excreted, and so tends to exhibit a cumulative effect, with slowing and depression of the heart's action. The symptoms of acute veronal poisoning (dose over 60 grains) are coma, retention of the urine or frequently anuria, skin-eruptions, exceptionally delirium, pin-point or small pupils, regular but feeble pulse of 80—120, sometimes diplopia. Persons taking 150 grains or more have generally died, death occurring in coma after from 18 hours to two or three days; much of the veronal can be recovered from the urine of these patients. Tolerance for the drug is not established; cases of chronic veronalism have been recorded, the chief symptoms being hæmatoporphyrinuria, wasting, debility, and anæmia. Veronal is not easily soluble; it should be given dissolved in a large volume of warm fluid—weak tea or milk or infusion of valerian are recommended—when unpleasant symptoms are less likely to follow its administration; it should not be given for more than fourteen days successively. The literature of the subject is given.

A. J. JEX-BLAKE.

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Reviews.

" A Series of Midwifery Diagrams for Midwives and Students of Midwifery." By VICTOR BONNEY, M.S., M.D., F.R.C.S., M.R.C.P. Bristol: John Wright & Co., 1906. Twenty-four sheets, 42s. net.

THIS series consists of 160 drawings arranged on 24 sheets intended to be used as wall diagrams. The subjects illustrated are well chosen in most instances, and the diagrams are clear and definite in meaning, though very coarse and ugly in execution. The sheets are 26 by 40 inches in size, and each contains six or seven drawings, which are thus too small to be clearly visible from the back seats of a lecture room of ordinary size. The paper is so thin and crumples so easily that the sheets are unsuitable for repeated use. Mounted on some firm fabric their value would be much increased.

" Pelvic Inflammations in the Female." (Being the Ingleby Lectures delivered at the University, Birmingham, May 9th and 16th, 1907.) By THOMAS WILSON, M.D., F.R.C.S. Bristol: John Wright & Co., 1907. Price 3s. 6d. net.

THESE lectures give an excellent account of our present knowledge of the inflammatory conditions which affect the uterine appendages, the pelvic connective-tissue and the adjacent peritoneum. This account is based on ample material, for the writer has analysed the post-mortem records of the Birmingham General Hospital for 15 years. But of 8,714 gynæcological cases seen by him he found that 1,802 (12·5 per cent.) were examples of pelvic inflammation, while he has carried out the operative treatment of 307 cases of the same kind. The result of experience such as this recorded by an observer with Dr. Thomas Wilson's judgment and acumen is necessarily of the greatest interest and importance. In acute puerperal infection the use of the curette is deprecated, as also is treatment by the more radical operations. " Recovery often takes place without the aid of surgery in cases that appear practically hopeless. Most of the patients operated upon under these conditions die, and it is open to doubt whether the few who survive do so because of or in spite of the operation." The writer thus condemns removal of the uterus and appendages in early puerperal infection, and limits his operative interference to gently cleansing the uterus and vagina and draining abscesses by the nearest route. In treating chronic cases Dr. Wilson generally operates

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by the abdominal route, but allows that operations through the vagina are most useful in certain of the less severe cases in which intervention is indicated. He thus takes up a moderate position on the much discussed question of choice of route. Considerable attention is given to the value of leucocyte counts in diagnosis, and the bacteriology of the conditions described is adequately discussed. These admirable lectures will prove of interest to most members of the profession, and of great practical value to all obstetricians and gynæcologists.

" Practical Fever Nursing." By EDWARD C. REGISTER, M.D. Pp. 352. London and Philadelphia: W. B. Saunders & Co. Price 12s. net.

WE fully agree with the author when he states in his preface that before a nurse can care intelligently for a fever patient she must have some knowledge of the disease and its medical treatment. The part of the book dealing with pathology and symptomatology is excellently written in a style which should be easily understood by a nurse, and will give her a sound and full knowledge of this group of diseases. We should like to have seen a reference to citrated milk under the heading of " methods of improving the digestion of milk." Where the author describes nursing procedures he might in many places have given a more detailed description. What is more important to a fever nurse than tracheotomy, preparation for it and after-treatment? This is dismissed in less than a page, and so is the treatment of scarlatinal nephritis. The preparation for a mastoid operation, list of instruments required, etc., we have searched for in vain. We draw attention to some of these omissions because we feel that it is only in this section that the book is weak, and their amplification, perhaps by co-operation on the part of the author with a nurse, in writing these descriptions, would make a second edition a most complete manual for the fever nurse. The information given is uniformly accurate, and we only found one misprint, but the index did not stand the tests we applied to it. The book will be very useful to the practitioner as well as to the nurse. Its circulation would be much increased if the publishers could see their way to lower the price somewhat. The circulation of a nursing book is seriously limited if the price exceeds, at the most, seven and sixpence.

" Diagnosis of Organic Nervous Diseases." By CHRISTIAN A. HERTER and L. PIERCE CLARKE. Pp. 690. New York and London: Putman and Sons. Price 12s. 6d. net.

AFTER a lapse of fifteen years the second edition of Dr. Herter's book on the " Diagnosis of the Organic Nervous Diseases " has appeared, but it has been revised and largely re-written by

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Pierce Clarke. It was originally designed as an aid to the student and general practitioner in the recognition of the commoner forms of nervous disease, and as such we doubt not but that it will prove of value. The advisability, however, of placing such a book in the hands of a student in preference to some definite system of neurology, and excellent systems exist which cover as few pages as this book, is questionable. It should be the aim of neurology as a branch of medicine to solve the mysteries of disease by logical deduction from carefully observed facts, and Herter and Clarke's book would be of little service in teaching the principles of this. The anatomy and physiology of the nervous system are, it is true, treated at considerable length, but throughout the volume anatomical and physiological facts are rarely applied in the diagnosis and localisation of disease. The reader is rather forced to rely on such indefinite statements as "the vomiting of intra-cranial disease depends on increased excitability of the gastric centre in the medulla," or "irritative lesions of the cerebellum sometimes inhibit the knee-jerk."

The first chapter is devoted to the structure and functions of the nervous system, the second and third to the localisation and diagnosis of the nature of lesions in it. The chief clinical types of nervous diseases are then described, and after the description of each type its differential diagnosis is discussed. It is regrettable to find such an indefinite term as "Ataxic Paraplegia" still employed as the title of a form of disease, especially as the authors have not accurately defined the clinical type to which it is applied or its morbid anatomy. In the sixth chapter there is an instructive review of the chief functional diseases, that is, those not associated with any anatomical change that can be seen, and of the points of distinction between these and the organic diseases. The last two chapters contain a description of the method of examination of the patient—which is very full and most admirable—and illustrations of diagnosis.

The book is well published, it is written in a style pleasant to read, and it is sufficiently illustrated.

"A Manual of Venereal Diseases." By Officers of the Royal Army Medical Corps. The Oxford Medical Publications, 1907. Price 5s. net.

THIS work, one of the best of the "Oxford Medical Publications" series, is written by officers of the Royal Army Medical Corps. Though no doubt primarily intended for service men, the book abounds in so much practical and up-to-date information, particularly in regard to Syphilis, that it may be confidently recommended to any practitioner. It has, moreover, the rare virtue in medical writings of being eminently readable. Following a short Introduction by Sir Alfred Keogh, K.C.B., Director-

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General of the Army Medical Service, there is a chapter on "History and Methods of Prevention," by Lt.-Colonel C. H. Melville, which will be chiefly of interest to the Sociologist. We note in this chapter a vastly higher tone than was customary some years ago in dealing with the question of prevention in the Army. Indeed, there is but little to support the attitude of those who joined the outcry against the Repeal Acts. The greatest combative factor again venereal disease would appear to be the growth of temperance. "The salient fact remains that as temperance has increased venereal disease has steadily diminished, and syphilis much more markedly so than gonorrhœa" (page 10). On page 25 the writer repeats: "The main fluctuations in the incidence of venereal diseases throughout the Army generally are independent of the presence or absence of repressive Acts." Full statistics are given, and the argument from these appears convincing. The writer is sanguine of further improvement in the Army with the growth of temperance and general hygiene, and, above all, advises teaching the soldier this physiological truth: that continence is not incompatible with health.

The section on Clinical Pathology and Bacteriology is by Colonel Leishman, and is, as may be expected, in the main concerned with the spirochæta pallida, which the writer is, on the whole, inclined to accept as the cause of syphilis. An excellent account of the organism is given, with full and simple directions for its demonstration in film and section. The differential diagnosis of S. pallida from other spirochetes is carefully given. According to the writer a distinctive feature is the shape and size of the organism, which has six or seven spirals in the space of 7·5 microns (the diameter of a red blood-cell), the distance between the summits of adjacent turns being thus 1 to 1·2 microns. He believes the "rigid" form of the organism (*i.e.*, those in which the spirals appear twisted round an imaginary straight line) shows it to have been alive when the specimen was prepared. Irregular forms, such as loops or figure-of-eight show probably that the organism had already died, such forms being commoner in long-ulcerated lesions.

The brevity of the chapter on Diagnosis must not be taken as an indication of the difficulties met with here. There are other skin diseases than pityriasis rosea, psoriasis and lichen planus, more likely to be mistaken for syphilis.

Moreover, to our mind, the book might have been improved by a fuller and more comprehensive description of the syphilides themselves. A sporting table of diagnostic "points" for beginners is given which seems open to criticism. The list cannot be quoted in full (syphilis is not to be "declared" with less than a total of 10 points), but we note that, whereas 9 points are given to the Hunterian chancre, 8 only are given to condylomata, and 7 to some of the skin eruptions. Two points are

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given each to anæmia, pyrexia (not otherwise explicable), continuous headache, and malaise, and 5 points to continuous slight loss of body weight.

It would be well if the principles of Treatment laid down by Major Pollock were universally acted upon. He emphasises the great fact that mercury should be our sheet-anchor *at any and every stage of the disease*. Other medicaments, including the iodides, are useful for certain manifestations, but nothing can replace mercury. The cure is effected by the *metal* mercury. When a certain amount of mercury has been introduced it ceases to exert a beneficial effect, and may be harmful. No hard and fast rule of treatment can be drawn up to meet every case. Certain hygienic rules (*e.g.*, the toilet of the mouth) are essential during treatment. We note that a two years' course of mercurial treatment is considered sufficient for service purposes.

The various methods of exhibiting mercury are fully described, the plan of intra-muscular injections of grey oil being recommended for routine service treatment.

A good chapter on Gonorrhœa and a useful Appendix giving formulæ, etc., conclude this excellent manual.

"Tropical Diseases": A Manual of the Diseases of Warm Climates. By Sir PATRICK MANSON, K.C.M.G., M.D., LL.D. (Aberd.), etc., etc. Fourth edition, thoroughly revised and enlarged. Cassell & Co. Ltd. Price 12s. 6d. net.

IN reviewing a manual so well known as this it is hardly necessary to commend it to the student of tropical medicine. It may be considered as indispensable, filled as it is with matter of the greatest importance, not only in theory, but also with what is often a matter of extreme comfort to the medical physician practising in remote tropical regions, viz., sound advice on treatment. We shall endeavour here, on the contrary, to point out what we consider to be faults, for it is hardly possible to expect that these should be absent in a manual of almost 900 pages.

On pages 44 and 45 some eight methods are described for staining the malaria parasite, but the Romanowsky-Nocht stain, a most excellent one, and easily made, is omitted. Again, the methods recommended for staining the flagellated body are as far as our experience goes, not trustworthy, and not likely to yield good preparations. It is surely, too, not an exquisite procedure to clean a needle soiled with blood by passing it through the lapel of the coat (p. 43).

We are of opinion that in many parts the book is permeated with hypotheses. These no doubt are valuable, but we think that they should be relegated rather to a treatise, as among the

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uncritical they are often confused with established facts. As an instance of this, we may quote the author's theories to account for the alleged outbreaks of malaria among those engaged on works entailing disturbance of the soil. The suggested explanations are, in fact, suppositions and analogies, but no definite facts exist in favour of them.

On page 147 a list is given of the anophelines "shown to be efficient hosts with more or less precision." Certainly in many cases the precision is less and the evidence in others is practically *nil*. The figures facing p. 148 of two well-known anophelines are so inexact as to be useless for any practical purpose.

Perhaps the articles dealing with diseases of bacterial origin are the least satisfactory; for example, the distinguishing characters of the *Micrococcus melitensis* are very imperfectly given, and it would be impossible to diagnose the coccus from the description given. Perhaps it is considered that the typhoid bacillus is too well known for description, for any account of it is entirely omitted. The description of the cultural characters of the comma vibrio and mode of isolation are insufficient and the mode of isolation of the vibrio from stools dates back to 1893. The recently elaborated methods of distinguishing a vibrio when isolated, though of the utmost importance, are barely discussed, and the subject of cholera vaccines is not brought up-to-date.

As indicating that this edition has been got ready with some haste and consequent inaccuracies we may quote the statement on page 151, that Forde encountered a flagellated parasite in the blood of a European suffering from an irregular non-malarial fever in the River Gambia Colony. Forde's own words were: "Small, worm-like, extremely active bodies, which I prematurely pronounced a species of filaria."

This haste is exemplified in numerous instances in the index. Thus on page 121 a valuable table of the solubilities, etc., of quinine salts is given, but this is not given in the index under quinine, so that it cannot be readily found when wanted. Again, in the index, three species of *Glossina* are given, but perhaps the most important of all, *Gl. palpalis*, does not appear. *Balantidium coli* is given in the index, but not the reference to p. 446 where it is described.

Perhaps, in conclusion, one striking omission should be mentioned in the text, viz., that of the parasite (*Histoplasma capsulata*) discovered by Darling in South America a few years ago. It would be ungracious to point out any more of these minor defects, although they are numerous. We would conclude by hoping that the 5th edition may be even better than the present one.

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"Bilharziosis." By FRANK COLE MADDEN, M.D. Pp. 78; 24 illustrations. Cassell and Co. Price 3s. 6d. net.

THIS short monograph gives an interesting account of Bilharzial infection as it is met with in Cairo. It is well illustrated with numerous photographs of cases in the author's wards in the Kasr-el-Ainy Hospital, and of pathological specimens prepared by Professor Symmers in the pathological museum of the School of Medicine, Cairo. In the first chapter we find an account of the parasite and a discussion of the more recent views as to its life history. The remainder of the book is occupied with a description of the pathological changes produced and their surgical treatment.

Although mild cases of Bilharzial infection are now not uncommonly met with in this country, the extent of the pathological changes and the amount of disease and suffering which this parasite is capable of producing can only be realised by most of us from the study of such a book as this. We cordially recommend it to all who are interested in the subject.

"What to do in Cases of Poisoning." By WILLIAM MURRELL, M.D., F.R.C.P. Tenth Edit. London: H. K. Lewis, 1907. Price 3s. 6d. net.

THE first edition of this little book appeared in 1881 and the fact that it has already reached the tenth edition is sufficient guarantee of its popularity. This popularity is a well-deserved one for none can read the book without being struck by the successful manner in which the author has presented a somewhat dull subject in a compact and interesting form. The present edition contains accounts of several new poisons.

"Post-Graduate Clinical Studies for the General Practitioner." By H. HAROLD SCOTT, M.B. (Lond.), M.R.C.S., L.R.C.P. First series. London: H. K. Lewis, 1907. Price 8s. net.

THIS volume contains nine articles on various subjects. The majority of them are based on papers read by the author at various medical meetings and subjects are chosen which, in the opinion of the author, are of more interest to the general practitioner than to the specialist. The most ambitious paper is on syphilis in the army, an essay prepared by the author whilst in the service. He is strongly of opinion that the Contagious Diseases Act in some modified form should again be brought into force and he supports his plea by convincing arguments. This article is well worth reading. We do not think that the author has been very successful in his choice of subjects for some of the other articles. Papers III. and IV. have as their primary object an exposition of the methods of arriving at the

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diagnosis of the presence of fluid in the pleural cavity, and of the nature of that fluid, without resorting to exploratory puncture as the author thinks that even such a small operation as this is often objected to in general practice. We must say that in our opinion more mistakes arise due to the failure of the general practitioner to use the exploring syringe, where such is indicated, than to any lack of skill in diagnosis, and we feel bound to deprecate any attempt to encourage him in the belief that it is a proceeding rarely to be resorted to. Many reputations have been wrecked due to this and we cannot believe that even in general practice refusal to use the syringe will be persisted in if the patient and his friends are made aware of the dangers such a refusal may entail. We think, too, that the author has made these papers unnecessarily complicated. The average general practitioner has forgotten all about Baccelli's sign and very wise he is to do so for it is not reliable nor do we think that Grocco's paravertebral triangle of dulness is of much help in the differential diagnosis of pneumonia and pleural effusion. The value of the paper on a case of acute endocarditis is much lessened by the fact that no autopsy was allowed and no bacteriological examination of the blood was made. Paper V. on the differential diagnosis of cerebral hæmorrhage, embolism and thrombosis is merely an extended account of the usual text-book description and the extension does not succeed in making the subject any more explicit. The author has evidently prepared these papers with great thoroughness and has consulted the most recent literature but we should advise him when he publishes further series of these clinical studies to remember that the general practitioner will find an explicit, graphic, readable account of a subject more attractive and more valuable than one much more thorough but less interesting.

"Hypnotism and Psychotherapy." By AUGUST FOREL. Rebman Limited. Price 7s. 6d. net.

DR. FOREL is a distinguished neurologist, and as well acquainted with the anatomy and pathology of the nervous system as he is with psychology and the pathology of the mind. His work is therefore entitled to careful attention. The book is of octavo size, 866 pages and well illustrated. The first two chapters are devoted to psychology and the problems of hypoconsciousness. In Chapter III. the thesis is maintained that hypnotism is a form of suggestion, the "dictation" of the Nancy school and that there may be a marked influence on the mind from auto-hypnotism. Most of the rest of the book is of a practical nature, the various methods of producing hypnosis are described, the results obtained in the practice of the author and others given, with numerous illustrative cases. There is a chapter also on the forensic aspect of medicine.

The book is interesting and undoubtedly valuable; it is

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written with much earnestness. There is a great deal of general interest in several of the chapters, for example, that treating of suggestion in the ordinary therapeutic work of every day. The reviewer heartily recommends the work for careful reading. The name of the author is a guarantee of the thoroughness and genuineness of his writing.

"Medical Diagnosis: A Manual of Clinical Methods for Practitioners and Students." By J. J. GRAHAM BROWN and W. T. RICHIE. 5th edition. William Green & Sons. Price 8s. net.

THIS book is designed to form a complete guide to bedside examination of the patient, and in addition to most of the laboratory methods in general use. The information given is detailed and precise, and the fact that the work is now in its 5th edition is an indication of its value. The extent of the information may be judged from the fact that such subjects as cryoscopy, cytology, opsonic index determination and the recent work on clinical interpretations of lesions of the auriculo-ventricular bundle are dealt with. The book is well illustrated.

"Text-Book of Diseases of Women." By J. CLARENCE WEBSTER, B.A., M.D. (Edin.), F.R.C.P.E., F.R.S.E., Professor of Obstetrics and Gynæcology, Rush Medical College, Chicago; Gynæcologist to the Presbyterian Hospital, etc. 372 illustrations; 10 coloured plates. Philadelphia and London: W. B. Saunders & Co., 1907.

THIS handsome volume of over 700 pages is a most valuable addition to the numerous text-books on Gynæcology published in recent years. Dr. Clarence Webster has a high and thoroughly well-merited reputation as a scientific gynæcologist and strenuous worker. Nine years ago he published a small manual of Gynæcology, but the present book is in every sense a new production. It bears on every page evidence of extensive knowledge and great experience. The numerous references to literature throughout the work attest the wideness of his reading.

In the preface Dr. Webster states that he has endeavoured to give prominence to the scientific basis of the subject. In this he has fully succeeded; and his chapters on Anatomy, Physiology and the Bacteriology of the pelvic organs are written with lucidity and distinction, and embody all the recent researches on these subjects. In the systematic description of pelvic diseases special attention is devoted to the clinical phenomena in their widest relationships, and a protest is made against the concentration of attention on local pelvic lesions without regard to physical and psychological conditions.

The chapter on Surgical Technique is excellent, and the methods adopted by the author are clearly and concisely described. Dr. Webster is a firm advocate for the use of rubber

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gloves, which he has adopted during the last eight years. He has also made extensive use of local anæsthesia, even for major abdominal operations, by cocaine or eucaine according to Schleich's method. He has apparently had no experience of medullary anæsthesia.

Operative measures are discussed in full detail, and those which Dr. Webster has found most valuable are recommended. In the treatment of retroflexion he adopts a method of shortening the round ligaments. Each ligament is drawn through the broad ligament at the side of the uterus and sutured to the posterior wall of the fundus which is thus slung forwards. The treatment of uterine myomata is fully discussed, and Dr. Webster concludes that, in view of the possible occurrence of malignant disease in the cervix, total extirpation of the uterus is usually preferred to the supra-vaginal operation. In the treatment of carcinoma of the uterus he believes that the best ultimate results are obtained by a radical abdominal operation. He describes fully the method as suggested by Sampson, and advises catheterisation of the ureters to ensure their safety. The most recent statistics by Wertheim and others on recent results are not quoted.

Dr. Webster has devoted much attention to "Enteroptosis," and the chapter on this subject is one of the most interesting in the book. We fully agree with him that this condition is an important factor in many gynæcological ailments and is often overlooked. He describes an operation for uniting the widely separated recti muscles, which has given excellent results in his hands.

This book is deserving of very high place among manuals of gynæcology, and will be widely used. It is written throughout in a clear and incisive style; the personal views of the author are expressed definitely, and are evidently the outcome of much thought and well-digested experience. The illustrations are very numerous, many being original, and the whole volume is an example of excellent work on the part of the publisher. It forms an admirable text-book for the senior student, and may be read with much advantage by the practitioner and specialist.

"A Laboratory Manual of Invertebrate Zoology." By GILMAN A. DREW. Saunders & Co., 1907. Price 5s. net.

DR. DREW, with the assistance of the members of the teaching staff of the Woods Hole Marine Laboratory in Massachusetts, has produced a new guide to practical work in Invertebrate Zoology, which has at least the merit of being novel in design. The student is not, as is usual, assisted by minute descriptions of the things he is to see, by elaborate instructions as to how he is to proceed, nor by diagrammatic figures of the structure of the organisms under his observation. He is given a series of paragraphs stating what he is to notice or to find out in a given

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dissection, followed by a number of questions the answers to which he is to discover by himself. To a really clever and conscientious student the manual will doubtless prove suggestive and stimulating, but the average student will find the instruction too slight to be of use, and the questions too difficult to answer unless he can obtain the assistance of other books or the services of an instructor. The manual will probably be found of more use to the teacher than to the student, as it gives him the result of the experience of the instructors in the Woods Hole Laboratory in demonstrating the structure of a great many more examples of the animal kingdom than are described in the current text-books. To the zoologist in this country many of the species described are unfamiliar, and the spelling is—well, aggravating, but nevertheless we feel that the manual is one which ought to find a place in every laboratory library.

"The Edinburgh Medical Journal." New series, vol. xxi. Edinburgh and London: Young T. Pentland, 1907.

THIS last volume fully maintains the high traditions associated with "The Edinburgh Medical Journal," providing many good original papers and much useful information on the progress of medicine.

" The Surgical Treatment of Cancer of the Colon." By JOSEPH OKINCZYC. Pp. 212. Paris: G. Steinheil. Price

THE subject of malignant disease of the large intestine has of recent years taken a prominent position in surgical literature. The present work gives a most complete and most interesting account of this important subject from a therapeutic standpoint.

The preliminary chapters on the methods of diagnosis are especially good.

The symptomatology of malignant neoplasms of the colon is as yet imperfectly understood and the author has collected together such symptoms as have occurred in his experience of a large number of cases and has discussed each in detail seeking to estimate the true position and value of each phenomenon. Modern methods aiming at more precision in diagnosis are fully described and their advantages or dangers candidly discussed. This portion of the work is well illustrated by some radiograms of bismuth in the large intestine.

The second portion of the work is devoted to operative treatment and contains an admirable chapter on the special features of malignant disease in this region and the bearing of these peculiarities in the results of surgical treatment. The difficulties and dangers of operative work in these cases are well described and are illustrated by numerous detailed reports of cases.

The limitations of excision, short circuiting and colostomy

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are lucidly described and a very good account is given of resection in one and two stages.

In brief this monograph is a most lucid and complete statement of the present state of the surgery of malignant disease in the large intestine.

" A Text-book of Obstetrics." By HENRY J. GARRIGUES, A.M., M.D. 2nd edition, pp. 888, with 525 illustrations. Philadelphia and London: J. B. Lippincott Co., 1907. Price 25s. net.

THE author's aim in this work has been " to write a text-book, not a book of reference." He certainly succeeds in presenting his matter in a very clear and complete manner without, however, burdening his readers with a host of unnecessary details. His practical directions are generally good and reliable, and many useful hints may be gleaned therefrom for the treatment of some of the minor but still often troublesome complaints both of the mother and child. The important subjects of hæmorrhage, eclampsia, and puerperal infection are adequately dealt with both from the medical and surgical standpoints. The work is profusely illustrated, and is well up-to-date. It should prove a valuable addition to the library of every general practitioner and obstetrician.

" Prevalent Diseases of the Eye." By SAMUEL THEOBALD, M.D., Clinical Professor of Ophthalmology and Otology in the John Hopkins University, etc. Pp. 551, with 219 illustrations and 10 colored plates. Philadelphia and London: W. B. Saunders Company, 1906. Price 19s. net.

THE work has been written specially for general practitioners and takes into account the fact that most of their number are not skilled in the use of the ophthalmoscope and are not qualified to perform the more delicate eye operations. Great stress is laid on the necessity for the provision and the advantages of good oblique illumination, and quite rightly so for a great deal can be learned by this method that is overlooked by the usual more superficial and inexact examination without its aid. Every practitioner should be able to use this mode, have at hand an evanescent mydriatic, know how to turn the upper lid, estimate tension, observe the pupillary reactions and test at least roughly the central and peripheral vision.

In determining vision the old " feet " standard is taken. Reference to the preparations of specially named firms is made here and there and is objectionable in a medical text-book. Dr. Theobald is a great advocate of the frequent use of very large probes in cases of lachrymal obstruction. Opinion, in this country, is tending strongly in the opposite direction even to the

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avoidance of probing altogether. The opinion is expressed that herpes corneæ febrilis, post malarial keratitis and dendriform keratitis are due to lesion of the ophthalmic ganglion but no definite evidence is adduced in favour of this theory. Sympathetic disease is said to be preceded by and dependent upon pathological changes in the ganglia connected with the fifth cranial nerve and in the brain centres that have to do with the metabolism of the eye, the disease being therefore really of trophic origin. Here again the view taken is widely different to the commonly accepted theory here, viz., that the sympathetic uveitis is caused by micro-organisms transmitted from the exciting eye.

Although the chief aim of the book is to give information concerning the anterior and external diseases of the eye a description is given of the deep seated affections.

In dealing with errors of refraction and their remote effects, Dr. Theobald admits that there has been much exaggeration by some, and he himself takes a moderate commonsense view which is, however, perhaps, a little in advance of that of many English writers who are inclined to be too sceptical on this matter.

On the whole the work is one that would be well appreciated by a medical in general practice. The illustrations are numerous and fairly good. There is an excellent index.

" Ulceration of the Cornea." By ANGUS MACNAB, B.A., B.Sc., M.B., F.R.C.S., Chief Clinical Assistant, Royal London Ophthalmic Hospital. Pp. 196. London: Baillière, Tindall & Cox, 1907. Price 5s. net.

THE author has, with very good reason, considered that ulceration of the cornea in its various forms is a subject of sufficient importance to warrant the production of a book devoted to it alone. He has condensed into the work practically all our present knowledge and although much work has been done there is still a great deal to be learned, many forms being obscure and the treatment thereof far from satisfactory. Classification is arranged rather with regard to bacteriology than to the actual clinical form and undoubtedly this is the scientific method. More importance is attached to the testing of the tactile sensibility of the cornea than is usual in text-books. In corneal abrasions, if the nasal duct is impervious it is advised that in all cases the lachrymal sac should be excised. In a large out-patient department this would seem to be a counsel of perfection almost unattainable, although its wisdom cannot be questioned as certainly the overlooking of lachrymal duct trouble leads often to most disastrous consequences to the eye.

Chapter X. is devoted to the common organisms formed in corneal ulcers and to the methods of differentiation by staining and cultivation.

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Treatment is thoroughly dealt with.

The type and paper are excellent.

The work should certainly be obtained and the method adopted by all who make any pretence to practice ophthalmology.

"The Science of Nutrition." By GRAHAM LUSK. Philadelphia and London: W. B. Saunders & Co., 1906. Price 12s. net.

THIS book consists of a series of fifteen essays concerning various problems of nutrition and metabolism, both in health and disease. The following are included in the subjects chosen: The fæces, starvation, regulation of diet, influence of proteid food, influence of mechanical work, normal diet, metabolism in diabetes, purin metabolism and gout, and theories of metabolism. Each of these essays consists of an able survey of work already done, with the writer's own research in many cases included. The language generally is simple, and the book forms a useful starting point for anyone wishing to work up either the whole question of nutrition, or any one of the subjects treated in the various essays.

"Le Ventre": An Anatomical and Clinical Study of the Abdominal Cavity from the point of view of Massage. Vol. ii.: "The Stomach and Intestine." By Dr. F. CAUTON and Dr. M. BOURCART. Genève Librairie Kündig, Editeur, Corraterie 11, 1908.

THIS is the second volume of a series the object of which is to treat scientifically the rationale and use of massage in affections of the abdominal organs. A full account is given of the anatomical and physiological details of the digestive tract, and numerous illustrations demonstrate the relations of the different organs. Researches are quoted illustrating the effects of massage on the digestive and absorptive processes carried out in the stomach and intestines. The technique of massage is fully considered, and the indications for its employment in different affections are clearly stated. The authors advocate most eloquently the use of massage in acute intestinal obstruction and acute appendicitis, but much as one admires the manner in which they state their case, yet one puts down the book with a feeling that the authors have been carried away by enthusiasm for their subject and have not displayed that critical spirit which is so necessary in considering new methods of treatment.

"Acute Pneumonia: Its Signs, Symptoms and Treatment." By SEYMOUR TAYLOR, M.D., F.R.C.P. London: Henry J. Glaisher, 1907. Price 1s. net.

THE contents of this little book were delivered as clinical lectures at the Post Graduate College of the West London Hospital. An admirable account is given of the symptoms of the disease, but we do not agree with the author in his statement that

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"herpes may be looked on as a constant symptom." Osler gives the frequency of herpes as from 15 to 40 per cent., and certainly that is more in accordance with our experience. The treatment recommended is for the most part that adopted by the profession generally. Alcohol, oxygen, digitalis and venesection are all recommended as suitable remedies in individual cases, though they should not be prescribed as a matter of routine. The author does not approve of blisters, and advocates hot packs rather than applications of cold in the treatment of hyperpyrexia, but apparently his experience of this method is extremely scanty. He is a firm believer in the exhibition of liquor ammoniæ acetatis (ʒiij every two hours), and claims that the onset of the crisis is hastened and the expectoration rendered less viscid by its employment.

"Physical Methods in the Treatment of Heart Disease." By ARTHUR G. DAMPIER-BENNETT, M.R.C.S., L.R.C.P. Bristol: John Wright & Co.; London: Simpkin, Marshall & Co., 1907. Price 3s. 6d.

IT is refreshing to read a critical description of the various physical methods used in the treatment of heart disease. Most books dealing with these subjects display such blind confidence in the various methods described that the reader lays down the book with a bewildered wonder as to how much he ought to believe. The writer, however, has had considerable experience of the methods of Oertel, Schott and others, and has succeeded in preserving his critical faculties, and his book is, therefore, a valuable one. The Nauheim bath is first considered, and the indications and contra-indications for its employment are discussed. The author believes that the action of the chemical constituents of the bath are due partly to the irritation of the nerve endings in the deep layers of the corium, and partly to absorption by the circulation. Oertel's and Schott's system of exercises are described, and also the indications for rest and massage. The part of the book that deals with electrical applications is the least convincing. Somewhat discursive chapters on diet and drugs in heart disease are added. Altogether the book will be found to be a useful one.

"Hygiene of the Lung in Health and Disease." By Professor Dr. LEOPOLD VON SCHRÖTTER. Translated by H. W. ARMIT, M.R.C.S., L.R.C.P. London: Rebman Ltd., 129, Shaftesbury Avenue, W.C., 1907. Price 2s. net.

WE have read this book with great pleasure. It is one of a series, the object of which is to assist the lay person to carry out his part in the hygienic advances that have been made in recent years. A clear account is given of the respiratory system, and some valuable advice is given as to the importance of fresh air and the avoidance of dust in the prevention of diseases of the

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lungs. For anyone who possesses a little medical knowledge the book is valuable, and we should think that most medical students and nurses would benefit considerably by its perusal. The lay reader will, however, have difficulty in following some parts of it, and it is a pity that the author has introduced many medical details that are of no assistance to a person ignorant of medicine and only help to confuse him. It is quite unnecessary in such a book as this to inform the reader that râles are heard in bronchitis, and that in pneumonia a coagulable exudation takes place in the air-vesicles and smaller bronchioles. With this exception we have nothing but praise for this book.

"Minor Medicine: A Treatise on the Nature and Treatment of Common Ailments." By WALTER ESSEX WYNTER, M.D., B.S. (Lond.), F.R.C.P., F.R.C.S. London: Sidney Appleton, 1907. Price 6s. net.

IN these days of scientific medical education, it is frequently stated by medical men of the older school that a newly qualified man is of no use to them, either as an assistant or as a locum tenens, on account of his inability to treat the minor maladies which constitute about 90 per cent. of the work of the general practitioner. The object of this book is to instruct the recently qualified man as to the nature and treatment of these maladies, and the author has been highly successful in his endeavour. Such diverse conditions as biliousness, baldness, insect bites, plant rashes, seasickness—to mention just a few of the many common ailments that are considered—are treated as far as possible in a scientific manner, and good, commonsense advice given as regards their treatment. A useful chapter is devoted to the consideration of the best mode of life for the maintenance of individual health, and such matters as exercise, food, clothing and diet are discussed. The least satisfactory part of the book is that devoted to the diet required in different diseases, such as diabetes and nephritis. The dietetic treatment to be recommended in the two diseases mentioned, differs so much in different stages and grades that the diseases may present, that general descriptions merely succeed in confusing the mind of the inexperienced practitioner, and he will find much clearer and more valuable information in most of the text-books, with which he is supposed to be familiar. We should strongly advise every recently qualified medical man to read and digest this book, and the experienced practitioner will find it useful to have it at hand for the purposes of reference.

"A System of Radiography, with an Atlas of the Normal." By W. IRONSIDE BRUCE. Pp. xi.+110. Imp. folio. Price 15s. net.

THE importance of radiography to surgery is well recognised, but it is not, even yet, realised how important it is to have a very

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thorough knowledge of the radiography of the normal subject. Since *x*-ray pictures are shadowgraphs, it is obvious that there is of necessity more or less distortion, and it is essential that the operator should have a definite position for radiographing each part of the body. Dr. Bruce in his system gives photographs of the positions of the patient and the landmarks for the radiographer's guidance for all the bones and joints of the body, and each position is illustrated by three radiographs taken in this manner of normal patients of 5, 15 and 25 years of age respectively. All the radiographs are taken from below, the patient lying on a canvas couch and the sensitive plate placed above the patient. An indicator above the couch shows the exact position of the tube, and this is moved about until it is above the bony landmark. Many operators, however, prefer working with the *x*-ray tube above the patient for nearly all positions, but this is a matter of choice except in radiographing the bladder where we think Dr. Bruce's system is wrong, since any stone is bound to lie at the lowest point of the bladder, and hence at its furthest point from the sensitive plate. The plates are mostly good radiographs, well reproduced and of actual size. We would have liked to see one or two taken stereoscopically, especially of the shoulder where this method is of great value.

The work is one that fills a long-felt want, and should be of great assistance to surgeons and radiographers alike. It should do much to correct the haphazard radiography that one too frequently sees and from which mistaken diagnoses are only too often made. We have no hesitation in recommending this system.

"Gynecology and Abdominal Surgery." Edited by HOWARD A. KELLY, M.D., F.R.C.S. (Hon. Edin.), etc., and CHARLES P. NOBLE, M.D. Vol. i., pp. 851. Philadelphia and London: W. B. Saunders Company, 1907. Price 35s. net.

THIS fine work, handsomely and copiously illustrated, in the way we are accustomed to in Prof. Kelly's publications, represents probably the latest and best teaching in gynæcological and abdominal surgery. Amongst the co-authors we note such well-known names as Edebohls, Murphy, Moynihan, Ochsner, Opie, Webster, Williams, etc, and, in our view, the contribution of these experts and their collaborators is quite up to expectation. Not only are the articles well and judiciously written, not being overburdened with unnecessary or elementary detail, but they are at once scientific and practical, and are in fact models of what a text-book should achieve. To give completeness certain obstetrical or gynæcological-obstetrical subjects are included, *e.g.*, puerperal injuries and infections, the treatment of incomplete abortion, ectopic pregnancy and the Cæsarean operations.

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Separate chapters on bacteriology, and the pathology of the female reproductive organs are given, and there is a useful section on medical gynæcology, in which non-operative measures are awarded just consideration. Turning to the surgical part of the book, the details of aseptic surgical technique, and the indications and methods of performance of the various gynæcological operations, abdominal and other, and including preparatory and post-operative treatment, are very clearly and fully described and pictured. Hysterectomy by both vaginal and abdominal routes is equally well pourtrayed, and the claims of both methods are carefully weighed. With regard to operation for fibroid tumours of the uterus, it is stated, as the result of a careful analysis of over 2,000 cases, that, whereas the risks of subsequent degeneration and complications in cases left alone will cause death in about 30 per cent., the mortality of immediate or early operation in uncomplicated cases is probably not more than 1 per cent.; the same rule is, therefore, advised for fibroids as for ovarian tumours, *i.e.*, early removal, unless there is some distinct counter-indication.

" Hygiene and Public Health." By LOUIS C. PARKES, M.D., D.P.H. (Lond.), and HENRY R. KENWOOD, M.B. (Edin.), D.P.H. (Lond.). Third edition; 95 illustrations; pp. 620. London: H. K. Lewis, 1907. Price 10s. 6d. net.

THE appearance of a third and carefully revised edition of this popular text-book will be welcomed. The present issue more than maintains the high standard of the former works of these authors and firmly establishes the position of the book as a thoroughly reliable and practical guide to the many departments of this wide subject. Not only is the latest information presented on drainage, smoke prevention, refuse disposal, etc., but such subjects as school hygiene, hospital construction and hygiene, climate and meteorology also receive their fair share of attention. Food, beverages and condiments, their composition, adulterations, etc., are duly considered. The contagions and their prevention are well discussed, in the light of the most recent researches; and the question of vaccination is fully dealt with. Chapters on Vital Statistics and Sanitary Law conclude the book. We would venture to suggest that in future editions more space might usefully be alloted to the diseases of occupation and their prevention.

" Surgical Applied Anatomy." By Sir FREDERICK TREVES, Bart., G.C.V.O., C.B., LL.D., F.R.C.S. Fifth edition revised by ARTHUR KEITH, M.D., F.R.C.S. (Lond.), etc. Pp. 640; 107 illustrations, 41 in colour. Cassell & Co. Ltd., 1907. Price 9s.

DR. KEITH has done good service in bringing this excellent little manual up to date. The character of the book, and especially

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its concise and readable style, has throughout been well preserved, whilst the additional illustrations, many of them coloured, greatly enhance the usefulness of the text. It is surprising the amount of information contained within so small a compass. We would particularly commend the accounts of the surface relationships of the brain and of the thoracic and abdominal viscera. We think, however, the description of the surface relations of the spinal cord might be still further improved upon. The book is one which may be repeatedly read with pleasure and profit by all medical men and students, and those who only possess old editions are strongly advised to consult this latest one, they will certainly be struck by the progress made during the last two decades.

"A System of Medicine." Vol. ii.: "Infectious Diseases." By OSLER and MCCRAE. The Oxford Medical Publications. Price 30s. net for single volume, 24s. net in sets of 7 vols.

THE work is a conjoint production by various eminent authorities, in this instance all but three of them belonging to the United States. Each writer is evidently intimately acquainted with the details of the disease which he describes, and not infrequently is well known for his own contributions to the subject treated. It is consequently a mere platitude to say that each article is complete and up to date. Nevertheless, being a compilation, it can hardly be said that the same high level is maintained throughout. This method is essentially valuable for the production of a work of reference chiefly, and amongst such this system of medicine must take a prominent place, though it is probable that in this respect the absence in most of the articles of a bibliography, and the reference to the numerous writers on the subject merely by name, will prove a serious drawback. The morbid anatomy, histology, and bacteriology of the different diseases are given in great detail, and it is in this respect that the book records a distinct advance on previous similar works, as many fresh observations have been made, and are here included. Established facts in these branches are all important for our further knowledge of the nature of the disease dealt with, but they are likely to be too intricate and purely scientific in character for all save those of special knowledge and experience. In general it may also be said that the clinical descriptions are clear, complete, and accurate, though there is little that is new to be recorded. There are a moderate number of small errors in orthography or of omission which have evidently escaped observation, but which will not cause any difficulty. The statement on p. 415 under Diphtheria, that nephritis "generally occurs at the end of the second week," is of a different description. Under Scarlet Fever, p. 345, despite the insistence of the writer, we fancy that few will agree with his conclusion as to the average

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period of incubation being "ten to fourteen days." Under the same disease also, p. 350, it is stated that the "upper and lower lips are pale." In view of the fact that the free borders of the lips are frequently unusually bright red, it is possible for such an expression to convey an erroneous impression.

In the instructions for making a pack, on p. 371, we are told to wring the blanket out of water at 100°F. It is not specifically stated that a hot pack is intended, though, as the treatment of nephritis is in question, presumably a sudorific effect is desired. Under the circumstances it is difficult to imagine that the writer has convinced himself of the paramount value of such a relatively low temperature.

As regards the diagnosis of laryngeal diphtheria, p. 420, we cannot help feeling that there are additional causes for the symptoms of laryngeal obstruction than those mentioned, more especially in children, and in the performance of tracheotomy for the relief of such condition, p. 440, though averse to the plunging method, and in favour of the adoption of careful dissection with hæmostasis as the routine procedure, yet it seems to us good advice to warn the physician against permitting the patient to die on the table through not opening the trachea. The experience which has seen many patients die on the table from blood flowing into the lungs must surely have been unusual.

"The Prevention of Infectious Diseases." By JOHN C. MCVAIL, M.D., D.P.H. Pp. xvi., 290. London: Macmillan & Co. Price 8s. 6d. net.

THIS volume consists of the Lane lectures, delivered by the author at the Cooper Medical College, San Francisco, in August, 1906, and revised for publication. Dr. McVail is County Medical Officer for Stirlingshire and Dumbartonshire, and evidence of his wide experience of his subject is seen throughout the book. The opening chapter deals with public health organisation in this country, and the succeeding chapters describe the measures adopted by the public health service in dealing with the principal infectious diseases. The volume is profusely illustrated with reproductions of photographs and diagrams which greatly enhance its value, and are as a rule excellent, though we think the map reproduced on p. 117 is on rather too small a scale to be legible. Dr. McVail writes in an interesting style, and the book fills a decided gap. It should be read by every M.O.H., as well as by all D.P.H. students, who will find in it much information very difficult to obtain elsewhere. If members of public health committees would study this book they would assuredly set a far higher value on the work of the public health service for the benefit of the community than—judging by recent events—some of them do at present.

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THE MEDICAL CHRONICLE.
A MONTHLY RECORD OF THE
Progress of Medical Science.

HALLUCINATIONS.*

By R. G. Rows, M.D., *Pathologist and Medical Officer to the County Asylum, Lancaster.*

In choosing the title of Hallucinations for my paper, I think that I have perhaps narrowed the subject too much, and that it will be more satisfactory if we employ a wider term, such as "The anomalies of perception." This is a term which will include the quantitative disturbances of perception and also illusions as well as hallucinations, without, I hope, unduly increasing the length of the paper.

But before I say anything about these anomalies of perception I should like to discuss briefly the question of perception from its physiological aspect.

We are enabled to communicate with the world around us by means of what are called our special senses, and all stimuli, which we receive from the outer world through these special senses, leave a trace of their action on the nerve cells which are affected by them.

The simplest stimulus which we can recognise is called a sensation, *i.e.*, an appreciation of some modification induced by an external agent (stimulus), and each variety of sensation is received by a special series of nerve cells in a particular portion of the brain, or, as it is termed, its sensory centre.

A perception is a rather more complicated process. It is defined by Tanzi as follows:—A perception is the process by which concomitant sensations are fused one with another, and with others, similar and dissimilar; it requires a certain amount of attention, and it permits of the formation of images of events and objects in time and space.

* An address delivered before the Burnley and District Medical Society, on November 28th, 1907.

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In order to obtain a clearer idea of this process let us examine the means by which we physiologically gain a perception of an object through our visual sensory centre.

The visual sensory centre, as you know, is found in the cortex of the occipital lobe of the brain and in the adjacent convolutions, but not every part of this region has the same function.

The stimulus of light which falls on the retina is projected to the region of the calcarine fissure, the cuneus, the lingual and fusiform convolutions, and the posterior pole of the occipital lobe; and it is here that the sensations of light and colour are received; but only these. From this ray of light which falls on the retina we learn nothing of the form and size of the object looked at. The appreciation of the form and size of an object is obtained from the action of the internal and external muscles of the eyeball and of the muscles of the head (Bourdon, Munsterberg, Seyfert, and others). The action of the muscles of the eye, which give rise to convergence and accommodation, enables us to recognise the profundity and shape of the object, and the movements of the eyes and head give us their relations in space.

Further, there is a third factor, viz., the comparison of the stimulus received with similar and dissimilar stimuli which we have received before, and it is by means of this that we discriminate and thus gain a clear perception of the object. The perception of an object is therefore not a simple process, but is the result of the association of (1) the appreciation of the sensation of light and colour; (2) of the form and size of the object, judged from the movements of the eyes and head; (3) the association of these two with the traces left by previous similar stimuli received.

From this association we arrive at the perception of the object, we get the concrete image of the object. But the visual perceptive centre of the occipital lobe and the adjacent convolutions does more than this. In the angular gyrus, which lies in front of the centre for concrete images, we receive the graphic signs of the words which represent the objects, *i.e.*, the graphic signs of the name of the objects, and it is by the association of these with the concrete images of the objects that we obtain a concept of the object.

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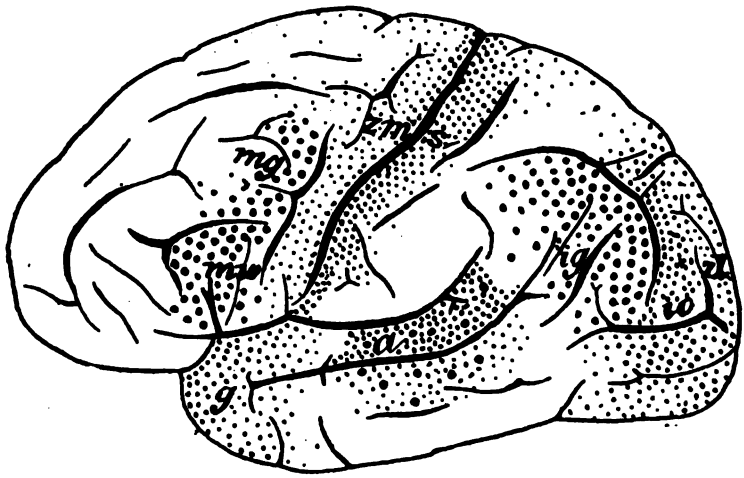
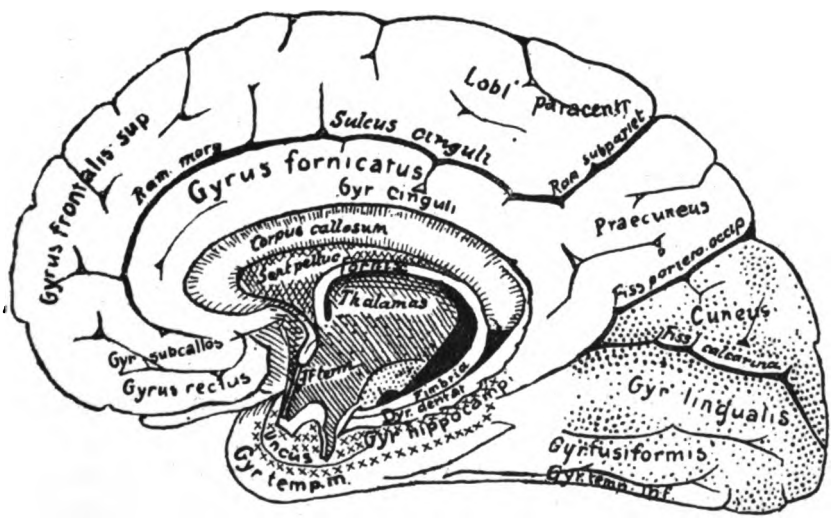


zl, zone for luminous images; *io*, zone for images of objects; *ig*, zone for graphic images; *a*, zone for auditory images; *g*, gustatory images; *zms*, motor sensory zone; *mw*, motor zone for spoken words; *mg*, motor zone graphic signs.



The dotted portion indicates the zone for luminous images on the mesial surface of the brain. The portion marked xxx is the zone for olfactory images.

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To quote an example used by Bianchi. If we hold an object, such as an orange, before an infant, it will at first be affected by the sensations of light and colour which it derives from the rays of light falling on its retina. But by continued experience it will gradually learn the size and shape of the orange from the action of the muscles of its eyes and head, and by the combination of these two, it will obtain a concrete image of it. Later it will acquire the graphic signs of the word orange, and by combining this with the concrete image of the fruit it will arrive at a concept of it. But during this time the infant will have learnt other characters of the orange through the other special senses; the weight and the feel of the rind of the fruit through the various peripheral sensory nerves; the taste through the gustatory sense; the smell through the olfactory sense; and it will have learnt the word orange through the auditory sense. All these sensations and images will have been received and stored up in the various perceptive centres, and it will be readily appreciated that a considerable portion of the cortex of the brain must be employed in the function of forming these various perceptions. This function, though, is only an elementary stage in our mental development, though some types of idiots never get beyond it. Further processes must go on. Just as the elementary images have been associated together in the various perceptive centres to form the concrete images and concepts, so these concrete images and concepts must be transmitted to the great associational centres, the frontal lobes, where they weave themselves into ideas of the objects. Moreover, our ideas of the various objects around us will be the more complete and comprehensive according to the number of concrete images and concepts which we form in our perceptive centres and associate together in our frontal lobes.

I do not wish, however, to convey to you that the frontal lobes are the only associative centres. All the perceptive centres possess projection fibres, *i.e.*, fibres which connect the centres of the brain with the peripheral apparatus, and also associative fibres, *i.e.*, fibres which pass from one convolution to another, and from one part of the brain to another. The projection fibres are most numerous in the centres where the most elementary

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sensations are received, *e.g.*, in the parts of the occipital lobe to which the rays of light are conveyed from the retina; the associative fibres are most numerous in the more complex centres. But most authorities are now agreed that the frontal lobes constitute the great associative centre, and it is to the frontal lobes that the images are transmitted from all our perceptive centres in order to build up our intelligence.

There is one point in this physiological process which I have already mentioned, but about which I wish to say a few words. I have referred to the formation and storing up of these perceptions, and it remains to be discussed, where they are stored up.

This very important question has given rise to a great deal of discussion, and there are two views which I wish to lay before you. On the one hand, there is the view of Munk, Wilbrand, Sollier, Tanzi and others, who say that the stimuli, which are received by the perceptive centres, are at once transmitted on to other centres of representation—situated in another portion of the brain—to be stored up there in the form of symbols, without leaving any trace or imprint whatever on the nerve cells of the perceptive centres themselves.

On the other hand, we have the theory of Tamburini and Bianchi that all stimuli received in a perceptive sensory centre leave a trace or an imprint on the nerve cells, that these imprints are stored up in the cells which receive them, and that these cells revive and give up what they have received, under the influence of suitable stimuli. For example, an image of an object is received into the area in which concrete images are stored up in the occipital lobe. It will leave a trace or imprint on the nerve cells, and when a similar stimulus falls again on these cells the concrete image will be revived through this trace.

Time will not allow me to go fully into this question, but I may perhaps lay before you some of the facts on which Tamburini and Bianchi rely to support their position. We must bear in mind that in their view a perception is not a simple process, a mere appreciation of a sensation derived from an object, but it is the result of the fusion of elementary sensations, as I showed you just now. They maintain also that the area of cerebral cortex which is engaged in the function of perception is more extensive

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than is generally admitted, *e.g.*, they consider that the visual perceptive centre occupies most of the occipital lobe and some of the adjacent convolutions, and not merely the area around the calcarine fissure, as suggested by the upholders of the other theory. Golgi, too, has recently expressed the opinion that, although we must admit that areas exist to which certain specific fibres are directly distributed in preponderating numbers, they are not so sharply circumscribed as some authorities suggest.

Now let us see what happens when certain sensory areas are destroyed or their function is impaired. The results of such lesions give us the various aphasias with which you are familiar.

There are some cases in which with a lesion of the angular gyrus the patient can recognise an object held before him, but is unable to revive the graphic signs, the letters, of the word which represents the object. This means that the centre in which the images of concrete objects are preserved is intact, but the centre which stores up the graphic signs of the words which represent the objects, is destroyed. By this lesion then the contents of the area destroyed, the graphic signs, are lost to the patient, and in people who have acquired a large part of their intelligence through reading, *i.e.*, by graphic signs, there will be a considerable dementia.

Destruction of the left first temporal convolution leads to the incapacity to hear words spoken by others, and also to the loss of the auditory images of words which have been stored up in it in the past. The result will be dementia, because of the inability to recall the words which represent objects. But if the lesion is outside the centre and cuts the path between it and the frontal lobes, words uttered by others will still be heard because the auditory centre is intact, but they will not be understood, because they cannot reach the intelligence centres, the frontal lobes. In such cases the stimulus which has arrived at the auditory centre, instead of passing to the frontal lobes, may spread to the motor centre for speech in the third frontal convolution, and the patient then repeat the words which he has received in his auditory centre, but without understanding them. This condition of ecolalia is often seen in the insane. Then again, if the path between the ear and the auditory centre is destroyed, we find deafness but not

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dementia, because the images of the words stored up in the auditory centre before the lesion can still be made use of, the paths to the frontal lobes being still intact.

From these and other facts it is inferred that each perceptive centre receives stimuli from the outer world, stores up what it receives, and reproduces the same when called on to do so by suitable means.

In connection with this I would say that it is doubtful whether in the normal adult such a thing as a pure sensation is ever experienced. Immediately a stimulus is translated into a sensation, comparisons and distinctions are carried out, stimuli pass to other centres by the associative paths, and a whole series of associations may be started leading to the formation of ideas.

So far, I have dealt with the normal physiological process of receiving perceptions of objects, of storing them up and of associating them together into ideas. I now pass on to consider the result of anomalous perception, anomalous in quantity and quality.

There may in the first place be a defect of perception owing to incomplete development of the nerve elements, *e.g.*, colour blindness; or it may be due to the underdevelopment of the brain, as in idiots and imbeciles; or it may follow the degeneration of once healthy nerve cells and fibres, as in the destructive lesions I described just now. In the first case false impressions are formed, in the others few will be received and these perhaps imperfectly. Then again, the mind may be fixed in some unusual emotional state, *e.g.*, melancholia or fear, and in this condition it is not free to give attention to ordinary stimuli.

Then, we must remember that the capacity to receive varies in different people and in the same person at different times.

These are the quantitative anomalies of perception. The qualitative anomalies include the illusions and hallucinations.

Bianchi defines an illusion as a disorder of perception in which the subject attaches to a present object characters which do not correspond to the reality, but which are awakened by altered associative mechanisms, or by an anomalous tension of certain nerve apparatus. Such a reproduction requires an objective stimulus. He gives the following illustration. If a

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nervous person, while walking at night, hears a noise, a rustle, and the idea of attack rushes into his mind, that may be a normal mental process stimulated by the emotion of fear under which he is labouring at the time. It is not an illusion.

But if he translates a branch of a tree or a tree-stump into a highwayman, he suffers from an illusion.

In such a case emotion and expectancy play an important part. But illusions are frequent withont any emotion. I was recently talking to a patient in the asylum who was complaining because she was not allowed to go home. I conversed with her for some time and could find little evidence of mental disturbance. At last she asked me if I had seen her brother lately. In reply to my question, why she had asked me that, she said, "you used to be such great friends together in Manchester twenty-five years ago." Nothing I could say could alter her illusion that I was the man who had been a friend of her brother, and when I told her that I had never been in Manchester until eight years ago, she plainly told me that I was not speaking the truth.

These mistaken identities of people and places are quite common.

Then again, tactile and kinæsthetic sensations often give rise to illusions. Examples of this we see in the case of amputated limbs, and in those who translate an abnormal sensation, due to diseases of some abdominal viscera, into a belief that they have no stomach or that they have snakes inside them.

Around these illusions a complex delirium may be built up. One man in Lancaster, who has had peculiar sensations in his body, is fully convinced that all the bones have been removed from his body, and this in spite of the fact that he is still able to walk about and carry weights.

In these cases not only is the perception altered, but the associative mechanisms are also deranged.

Somewhat different and much more grave is the condition in which, without an external or objective stimulus, the patient has a subjective perception, *i.e.*, a hallucination.

In the case of hallucinations there is no external stimulus, but images are revived so vividly that the patient is fully convinced of their reality, and mentally projects them into the outer

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world. Thus we find that patients say they hear voices which seem to come from a distance, from an adjoining room, from a chimney, or from under the bed; or they see objects or people around them or through the window. Frequently also they have visions when their eyes are closed. Moreover, these revivals send stimuli along the associative paths, and stir up the delirium which is so common in these cases.

Let us now pass on to enquire into the conditions under which they arise and the various forms which they assume. In the first place there can be no doubt that hallucinations and illusions have frequently been observed in people who have shown no other morbid manifestation, although in all probobility the hallucinations have exerted a greater or less effect on their lives.

Many instances of this have been recorded. Quintus Curtius Rufus saw a beautiful woman who told him that he would be proconsul of Africa. Van Helmont saw an admonishing spirit in all the important events of his life. Savonarola saw a hand in the heavens with a drawn sword. Cromwell saw a gigantic woman who told him he would be king of England. Luther heard a voice. And during the recent Welsh revival we read of many cases of visual and auditory hallucinations. In fact, Edmund Gurney expressed the opinion, that at least one person in ten experiences hallucinations at some time during life. This perhaps was an exaggeration.

Then you will all be familiar with the various degrees of hallucinations met with in acute fevers and in toxic conditions. Sometimes it is a noise or a voice is heard, or objects are seen, or sensations are felt, and sometimes hallucinations of all the senses are present together, especially in poisoning with alcohol or other drugs.

In pneumonias also and in typhoid conditions they are often met with. I remember one interesting case in which a patient had auditory hallucinations whenever his temperature rose above 102°, which disappeared again when the temperature fell, so that his temperature could be known from his mental condition.

Then in the cases of acute mania, it seems as though all the motor and sensory centres had run riot. Besides suffering from

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general excitement and restlessness, the patient hears voices around him and shouts in reply to them, he sees objects and people and rushes at them to attack them, he also has hallucinations of tactile sensation. All these disturbances of sensation may be associated together in a wild delirium which does not cease day or night.

In many of the acute manias, and of the other cases I have so far referred to, the hallucinations disappear on the removal of the toxic condition which caused them, although they often leave behind evidences of injury to the nerve centres.

But in the great majority of the patients in our asylums the hallucinations are the permanent and chief feature of the mental disturbance, differing, however, very widely in the degree of acuteness, and in the effects produced on the mind of the patient.

In some instances the patient is entirely absorbed with the hallucination. They are seen standing in a fixed position, carrying on a conversation with the voice they are hearing; some of them quietly muttering, others shouting a volley of curses and abuse in answer to the defamatory expression which they hear applied to themselves. Such patients will pay no attention to anything said to them, unless it is to curse whoever has interrupted them. I have one patient who is always to be found in one corner of the ward, and who carries on prolonged and often violent conversations with people whose voices appear to come from a distance.

Another woman thinks the birds talk to her, and she often goes to the window and converses with them. In fact, auditory hallucinations are met with in all sorts of forms.

Patients frequently imagine also that the voice reaches them by the telephone, and they will either stand in front of the telephone in the ward and reply, or they may place a fore-finger in each ear and then speak.

There is one point to which I wish to draw attention, and that is that a patient who is possibly hiding his hallucinations from you, and this he may succeed in doing for a long time, will frequently steal a side-glance to a special corner of the room, sometimes even while you are talking to him. In such a case

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you may feel certain that he is the subject of halluciations. I saw a well marked instance of this recently. A man, who had been in the asylum for about a year, and who for months had worked in the printer's shop, began to worry me to send him home, and as a matter of fact, I could discover little wrong with him. He denied having any hallucinations over and over again. I noticed, however, that he glanced to the right a few times and taxed him with it, but he still denied having any hallucinations. At last, however, he broke down and became disturbed, restless, and mischievous, and then, being off his guard, he admitted that he heard people talking to him, and had done so continuously. He is now quieter again, and has returned to the condition of denying that he has now, or ever has had, any hallucinations.

Other cases see objects and visions, and they are so real to them that they imagine that those around them can see them also. One man, when a doubt was expressed about his visions, said in an angry tone "shut your eyes man and you will see it under the floor."

In other cases the visual hallucinations are very terrible, and these produce a correspondingly greater mental disturbance.

Another class of case consists of those whose centre for tactile sensibility is disturbed, and who complain of galvanism or X-rays acting on them, or of vermin crawling over them. One patient says she feels worms and insects crawling over her, and she often goes through the movement of collecting some of these in her hand, and will ask you to look at them. The same woman also thrusts out her hand frequently, and tries to grasp the vermin which she sees floating before her eyes.

Hallucinations of taste and smell are less common, but are very important, because they so often lead the patient to refuse food.

Next we pass on to consider what have been termed by Lugaro "pseudo-hallucinations," or as they have been called by others "internal" or "visceral" hallucinations.

In the case of the ordinary hallucinations, *e.g.*, auditory hallucinations, the patient always says that the voice comes from outside and he hears it with his ears. But in the case of pseudo-hallucinations he will say that it is inside; it is produced inside,

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and is not heard with the ears. He will say someone talks in his head, or that he hears a voice in his stomach, or in his throat.

One case used to hear voices from outside, but recently he has lost these, and instead, he hears a sound in the back of his head, as though someone was there speaking. Lately he has said that this voice in the back of his head makes him utter aloud syllables and disconnected words, or as he puts it "mere incomprehensible nonsense." One word so uttered was "spoglion"; he did not know where it came from or what it meant.

Another case used to say that he had a spirit in his abdomen, which talked, and made use of his vocal apparatus while doing so.

One day when asked whether he would like to go out into the grounds, he uttered the following: "If you go out I will punish you; I will knock you down and half kill you." Then he turned to me and said: "That was the spirit speaking, it was not John."

It is a striking peculiarity of these cases that the patients always attribute the pseudo-hallucinations to some agency outside themselves, it is the voice of God or it is telepathy, something altogether distinct from their own personality. They are in fact possessed by a spirit. Another frequent accompaniment is that, recognising that someone is able to put these thoughts into their brain, they see no reason why the same person or agency should not also read their thoughts; and they will tell you that their thoughts are read before they have time to utter them.

Then again real and pseudo-hallucinations are frequently present in the same patient. One man says that he hears one voice inside his head and a second with his ears; another hears a real hallucination with his right ear and a pseudo-hallucination inside his head on the left side. If then the real and the pseudo-hallucination should happen to correspond, the patient may think that someone repeats what he utters, and he will often attack anyone near him for mocking him by repeating what he has said.

Another interesting variety of hallucination is that which we find as the result of a disturbance of the centre for muscular

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sense of the phonetic apparatus; these are called psychomotor verbal hallucinations. The hallucination of muscular sense by itself would be difficult to detect, but we see evidence of it in movements of the tongue and lips, and in complaints of peculiar sensations in these organs. I have seen the tongue and lips of a patient almost constantly moving while I was speaking to him, and at last he said, "Did you hear that?" He had the impression that he had spoken aloud, but no sound had been uttered. Possibly in some of these cases true auditory hallucinations are present at the same time.

These then are some of the many kinds of hallucinations and the forms they assume, and you will easily understand that they produce grave disturbances of mental processes.

The disturbances of the mental processes differ very much in the various cases. Some of the altered conditions I have mentioned when dealing with the forms of hallucinations. But what may appear to us to be the same hallucination, *e.g.*, hearing accusations made against the character, will produce quite different results in different patients.

In one case accusations of this sort will drive a patient to violence against other people whom he may consider to be the source of the imputation; in another case very little notice will be taken of it, the patient will continue to work and will show that he is troubled only when the hallucination becomes a little more acute. In a third class of case the patient will pass into a condition of melancholia, in which he may quietly submit to a constant torment and lead a perfectly miserable existence, or he may be driven to self-destruction. One woman told me recently, that the spirit of the evil one had lodged itself in her left side, and was constantly telling her to destroy herself, and she added: "I have been able to resist so far, but someday I shall be obliged to do as it tells me."

The resulting mental condition, therefore, does not depend simply on the character of the hallucination, but will be determined largely by the previous mental personality of the subject, by his mental equilibrium. The chief factors which will decide the result will be the degree to which the mental personality is changed, the emotional character of the patient, and the ease

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with which the emotions are aroused and pass over into action. There are some who are entirely dominated by the hallucination, their mind is rivetted on it, and they pass into a kind of stupor in which they pay no attention to people or events around them: they never speak, they neglect themselves in every particular, they never move of their own accord. Sometimes, however, they may get a lucid interval, in which they show they are not intellectually dead, they have noticed, and they will tell you, what has gone on around them, and what has been done to them, and they will say that they have been controlled entirely by the hallucination.

Occasionally the hallucinations are pleasant in character. One woman told me that she heard voices talking to her and she added: "I see things also, visions." In reply to my question as to why she did not break through such control, she said "I do not wish to." Such hallucinations are generally sexual or religious in character.

You will have understood from what I have said that the normal power of attention may be weakened or entirely lost. The perceptions in these cases will be incomplete or mistaken, and there will follow false judgments and all the grotesque fancies of the insane.

There yet remains for us to consider where these hallucinations are initiated, where they start.

You will remember that when I was speaking of the physiology of perception, I referred to the two schools, one of which supported the view that symbols of images are stored up in a special centre of representation, and the other maintained that images are stored up and reproduced where they are received, and I laid before you certain evidence in favour of the latter hypothesis.

Both schools agree that the hallucinations start in the centres in which the images are stored up.

If we apply the second principle to hallucinations, we must say that auditory hallucinations are started in the first temporal convolution; visual hallucinations of an object in the perceptive centre for concrete images in the occipital lobe, and of words in the centre for the graphic signs or words in the angular gyrus;

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and hallucinations of the tactile sense in the somæsthetic area, the central convolutions, and so on.

Bianchi refers to several cases of hallucinations of hearing and of sight, in which, post-mortem, some lesion, *e.g.*, a tumour, was found in the corresponding centre. And in cases of unilateral hallucinations, changes have been found in the corresponding centre. He describes in detail one very interesting case, in which there was found a syphilitic osteitis of the right side of the skull and great thickening of the dura mater, which was adherent to the underlying brain substance. It extended from the foot of the frontal lobe to the occipital region, and spread by a bridge across the sylvian fissure to the first temporal convolution. The maximum intensity of the process was in the parietal region. The remainder of the dura mater was healthy, and there was nothing abnormal found on the opposite side.

The nodules in the parietal region gave rise to Jacksonian epilepsy, the extension into the occipital region to hallucinations of sight, and that into the temporal convolution to hallucinations of hearing. In this case there was direct irritation of the visual and auditory centres by the thickened dura mater. But are all hallucinations due to such direct irritation, or may they be produced by indirect irritation of the perceptive centre, along the peripheral nerve on the one hand, and from the ideational centres on the other hand?

Here again we find great divergence of opinion. Binet said that all hallucinations must start in the periphery. But this, according to most authorities, is true in a very small percentage of cases. Stimulation of a peripheral sensory organ, the retina or the organ of Corti, will give rise to sensations of light or sound respectively, but not to concrete images of objects or words. In diseases of the eye and ear, sensations of light in the one case, and of sounds, whistling and hissing in the other, are fairly common. But these are not hallucinations.

There have been instances, however, of images being awakened by stimuli which have ascended to a centre from an abnormal or morbid peripheral sensory organ. Bianchi mentions one case of hæmorrhage into the retina which gave rise

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to images of animals and insects. I also have seen one case in which the patient saw insects while he was suffering from a hæmorrhage into his vitreous, which was produced by a blow from a tennis ball.

He only saw them, however, when tired, and Bianchi says that the condition of the centre is of importance in the awakening of the image, that is, there must be a morbid irritability of the centre, almost a tendency to hallucinations.

It seems to be proved therefore that in some cases the stimuli from a morbid periphery play an important part in determining hallucinations of concrete objects.

Then, it is not rare to find a history of noises in the ears which have existed long before any hallucinations have appeared. One such case has just been admitted into Lancaster. A woman had otititis media in childhood and repeated attacks since, and as a result she became totally deaf on the left side and markedly deaf on the right. She had heard sounds in her ears for years, but more on the left side. One day she heard on the left side, a man's voice, which told her to go to the *Observer* Office. This was repeated so often that at last she went, and when she had explained the reason of her errand, she was arrested and sent to Lancaster. It is interesting to mention that two or three weeks later she began to hear voices in the right ear also, but there was this difference; she says that the voice heard on the left, the totally deaf side, appears to be in her ear or in her head, while on the other side, the voice seems to come from a distance. This is an instance of real and pseudo-hallucinations in the same patient.

But in the other cases there is a delirium, or there are delusions first, and the hallucinations appear later. In these we must assume that there is some irritation of the higher or ideational centres, and that a stimulus passes back to the perceptive centres, and awakens concrete images there.

In all the cases, therefore, according to the view of Tamburini and Bianchi, the image of the object seen, of the word seen, of the word heard, is reproduced in the perceptive centre in which it was received and stored up, and the term "anomalies of

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perception," as applied to illusions and hallucinations, is therefore justified.

I wish, in conclusion, that I could say something definite with regard to a scientific treatment of these conditions.

It is true that a certain proportion of the patients lose their hallucinations, as I said just now, but for the others we do nothing more than house and feed them.

Unfortunately, in this country, we seem to make no effort to get at these cases in the early stages of the illness. Until quite recently we have had no clinics to which these mentally disturbed people could turn for advice, and even now there are only a few hospitals which have made any provision for the treatment of such cases. Nothing is done until the disease is so far advanced that it is no longer safe for the man or woman to be at large, and then the relieving officer takes them in hand, and conducts them to an asylum.

The relieving officer, in many cases, is the first to see them, and he diagnoses whether they are suicidal, epileptic and dangerous, or not, for the benefit of the asylum authorities.

Another matter to which I wish to draw your attention is this, that the subject of psychiatry is not taught in a comprehensive manner in a single university or college in this country, and therefore the real importance of these hallucinations as an early sign of mental disturbance, and the importance of recognising and treating them in the earliest stages of their existence, is not fully appreciated by many of those who alone have the opportunity of doing so.

Now I have no doubt that instances have occurred in the experiences of most of you, in which a satisfactory recovery has been the result of early diagnosis and early treatment of patients who were troubled with hallucinations. But it is the common history of those patients, who are brought to our asylums, that their hallucinations have existed for one or even two years. This means that the cases have reached a chronic condition before they are sent to an asylum, and, during this period, in the majority of instances, nothing has been done to help these unfortunate people.

As an example of this I may mention the case of a man who

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was admitted into Lancaster Asylum this year, who was in a state of terror because of his auditory and visual hallucinations. On enquiry I found that he had been troubled for more than nine months. He first heard a voice occasionally at night, but was able to put it aside and it had very little influence on him. Gradually, however, it became more troublesome, he heard it almost constantly and his sleep was much disturbed. At last he began to hear it during the day, and then of course his general conduct became altered, and he was sent to Lancaster.

Now I do not wish to suggest that any great good could be done to every case, to those who have a " tendency towards hallucinations " as Bianchi expresses it, but I think there can be little doubt, that we could ward off the evil day for some of these patients if it was possible to take them in hand in the earliest stages of their illness.

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ON HYPERPIESIS AS COMPENSATORY OF INCREASED PERIPHERAL RESISTANCE.*

By R. F. VERE HODGE, M.B., B.C. (Cantab.).

MANY pathological conditions are associated with an increased blood pressure and clinical experience leads us to believe that where the blood pressure is raised above certain limits, the condition of the patient is abnormal. At the present time when the importance of the blood pressure in disease is being more fully recognised, and when clinical methods of accurately estimating it have only recently come into general use, there is perhaps a tendency to study this sign to the exclusion of the rest, and to gauge the condition and progress of the patient solely by the height of the blood pressure and by the changes in it we have recorded while under treatment.

We see daily in the post-mortem room the ultimate disastrous results of high pressure, and we are urged on therefore to try and prevent these by every means in our power.

In this paper it is proposed to discuss the relation of hyperpiesis to the conditions in which it occurs, and to attempt to shew that in certain conditions it has a compensatory action, tending to modify the evil results of various lesions of the circulatory and excretory systems.

Before going further it is necessary to discuss briefly the causes of hyperpiesis. Hyperpiesis is a mechanical effect for which we have to seek an immediate mechanical cause. Now the height of the blood pressure depends on two factors, (i.) the work done by the heart, (ii.) the peripheral resistance. Of these the latter is the more important. For in normal circumstances we find that the work done by the heart varies with the peripheral resistance, sufficient work only being done to produce an even blood supply to the tissues. On the other hand increased cardiac output whether from increased rate or force of beat causes a very

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temporary increase only in pressure, this being rapidly neutralised by a increased outlet through the arterioles. Under pathological conditions we can imagine the co-ordination becoming incomplete (but we have no evidence of hyperpiesis of purely cardiac origin). We may assume, therefore, that the peripheral resistance determines the height of the blood pressure, and that the immediate mechanical cause of hyperpiesis is increased peripheral resistance.

We have now to consider in detail the means by which increased resistance may be brought about. Four possibilities suggest themselves:

(i.) *Contraction of the arterioles.*

It is well known that in normal circumstances these vessels form the chief part of the peripheral resistance. It is natural, therefore, to suppose that hyperpiesis may be due to their being in a state of increased contraction.

(ii.) *Changes in the capillary area.*

Formerly the capillaries were considered to be an important factor in forming the peripheral resistance. This view is, however, not generally held now. Campbell, from a study of anatomical considerations, has ably demonstrated the impossibility of the capillary resistance forming anything but a minute portion of the total resistance. He pointed out the shortness of the capillary tract, its wide lumen and the slowness of the blood current through it. He further argued that if marked difference of pressure existed between the two ends of the tract, bearing in mind the delicate nature of the vessel walls, the proximal end would be more dilated than tht distal and the tract would therefore assume a funnel shape. This is not found to be the case. We may, therfore, dismiss capillary changes as being unimportant in increasing resistance.

(iii.) *Increased viscosity of the blood.*

Of this as a cause of increased resistance we have little definite information. The investigation of these changes is a matter of extreme difficulty owing to its complex composition and ready coagulation.

Hirst and Beck have put forward the hypothesis that as in

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hyperpiesis both right and left ventricles show hypertrophy, we must look for some cause active throughout the whole circulation. They therefore suggested increased viscosity of the blood as a probable cause, and proceeded to experimentally compare the viscosity in normal persons and in those suffering from nephritis. Their results were inconclusive; out of 22 cases of nephritis the viscosity was raised in three only. In two cases of uræmia the viscosity was increased.

Burton-Opitz, working with dogs, found that alcohol injected into the intestines produced a temporary increased viscosity, the increase occurring within ten minutes. Bottazi, working with defibrinated blood, compared the viscosity in a normal animal with that in one on which a double nephrectomy had been performed. He was unable to find any marked difference. We see therefore that our experimental evidence as to the alterations in viscosity which occur is extremely indefinite.

(iv.) *Structural changes in the vessel walls.*

As to these as a cause of high tension, we find widely divergent opinions. While the majority of German observers hold with Von Basch that structural changes are primary and the increased tension due to the damaged condition of the vessel wall, English writers seem to consider that structural changes are not a cause of high tension. Thus, Professor Sir T. Clifford Allbutt strongly puts forward this view, pointing out the common occurrence of arteriosclerosis without high tension. We, however, certainly do find hyperpiesis and arteriosclerosis associated together to a remarkable extent, and by many the arterial changes are attributed to the increased strain caused by high tension. The evidence of this is, however, by no means complete. For, although Josué and other observers were able to produce arteriosclerosis artificially by injecting adrenalin, yet it has been proved by Braun that this effect could not be attributed to the rise of pressure thus induced, as the same effect was obtained by the injection simultaneously of adrenalin and amyl nitrite, by which means the increased tension was avoided. Many other and contradictory effects have been obtained, and Braun's creed can hardly be regarded as final.

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We may therefore for the present leave undecided the question whether structural changes in the vessels are primary or secondary to hyperpiesis.

Clinically we may divide cases of hyperpiesis into the following groups:—

i. Cases of transient high pressure due apparently entirely to arteriolar spasm over large areas and without definite arterial or renal lesions, and showing the condition well described by Dr. Russell as hypertonus. These cases frequently pass unrecognised, and are associated with various pathological conditions, and especially commonly with derangements of the alimentary system, such as dyspepsia and constipation. By treating the latter condition we can usually succeed also in reducing pressure.

ii. Cases showing the rising pressure of advancing years. In the original paper by Professor Sir Clifford Allbutt describing this condition, the chief characteristics of the cases quoted were (*a*) the advanced age of the patients; (*b*) the absence of all signs of renal disease, and in some cases also of arteriosclerosis; (*c*) the readiness with which they reacted to treatment with deobstruents and potassium iodide, there being a marked improvement in the general condition accompanying the fall in pressure. It would seem probable therefore that in these cases, as in the first group, the immediate cause of hyperpiesis was arteriolar spasm, caused perhaps by toxic products of faulty metabolism.

iii. Cases with persistent hyperpiesis, commonly associated with well-marked arterial lesions, with or without renal sclerosis.

iv. Cases primarily renal in origin.

These last two groups are closely related to one another. In both we find persistent high pressure, associated with definite organic lesions affecting either or both the arterial and renal systems. It has been suggested that in all cases of hyperpiesis some renal inadequacy is present. In this connection the work of Dr. Batty Shaw is of interest. He found that fresh extract of kidney contained a body, also found by Tigerstedt and Bergman, which had a pressor effect on the circulation, and he suggested that during life a constant destruction of kidney substance

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occurred letting free this body into the circulation and there raising pressure. He also found that in 12 cases of hyperpiesis, 11 showed albuminuria. The twelfth was a case of plumbism, in which it was reasonable to infer some renal degeneration. From this he concluded that some degree of renal degeneration is present in all cases of high pressure.

It would appear that the first two and last two varieties we have mentioned are closely related. We may therefore divide cases of hyperpiesis broadly into temporary and persistent.

To recapitulate shortly what we have said. The immediate mechanical cause of hyperpiesis is increased peripheral resistance. This in turn may be caused by spasm of the arterioles, increased viscosity of the blood or structural changes in the vessel walls.

Clinically we find cases of hyperpiesis broadly divided into temporary and persistent, the latter accompanied by definite organic lesions.

Our object now is to investigate the relations of hyperpiesis to the conditions in which it occurs. It is obvious that in a strictly mechanical sense hyperpiesis is compensatory of increased resistance. It remains for us to study the clinical question as to whether in pathological conditions it has a compensatory action in overcoming an increase of resistance associated with arterial degeneration and changes in the viscosity of the blood, or whether it is merely to be regarded as a vicious effect of vascular spasm. In other words, our investigation resolves itself into an enquiry as to the nature of the increased resistance met with in hyperpiesis.

To throw some light on this problem, a clinical examination of certain cases of high pressure has been made, and the effect of treatment in reducing pressure has been observed. The points especially studied have been : (1) The means by which reduction of pressure may be brought about. Thus, in cases where hyperpiesis is due wholly or in part to arteriolar spasm we might hope to be able to reduce pressure by the various means at our disposal. In any given case it is not necessary to suppose the increased resistance to be wholly of the same character, and we can conceive a condition of high pressure due to mixed causes. By observing the reaction to treatment we may be able to

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differentiate the relative proportions due to the two factors. (2) The effect of reduction of pressure on the general well-being of the patient. In every case it is possible to reduce pressure by cardiac depression. We want to be certain that we are not doing so by this means.

The chief means of treatment which we have had the opportunity of observing have been (*a*) rest in bed; (*b*) drug treatment; (*c*) baths. Before going further we must understand as far as possible in which way we are influencing the body by these various means of treatment.

To take first the effect of rest. It has been shown by Oliver that in normal people the blood pressure is lower while at rest in the recumbent position than in the erect attitude owing to diminished cardiac output. It remains for us to find out whether prolonged rest has in pathological states any more permanent effect in reducing pressure.

As to drugs, we may divide them in three classes—(i.) purgative; (ii.) vaso-dilator; (iii.) iodides.

It is difficult to suppose purgation as having anything but an indirect action on the blood pressure, namely, by stimulating the excretory function of the lower bowel. But in cases of temporary hyperpiesis at any rate purgation produces marked effect in lowering the blood pressure. By giving nitrites we dilate the arterioles. We ought therefore to be able to abolish the increased pressure due to spasm of the arterioles.

Our knowledge of the pharmacological action of the iodides is still very incomplete. It has been commonly given, to a large extent empirically, in cases of arteriosclerosis and hyperpiesis, but that it has any action in reducing pressure is uncertain. Stockman and Charteris found that in people of normal blood pressure it produced no reduction.

The observations of Edgcumbe and Bain show that hot baths, whether of air or water, have the effect of lowering pressure, at any rate temporarily, by relaxing the arterioles.

In the cases under observation it has not been found possible to employ these measures separately. This is, however, unimportant, as it is not our object to investigate the relative efficiency of these various measures, but rather to study the total

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results of treatment. Taken as a whole, the combined effects of these measures should be a relaxation of the arterioles combined with increased excretory activity of the bowel.

The cases which we have collected may be divided according to the classification already given into temporary and persistent. Hyperpiesis as a temporary abnormality would appear to be very common and to occur in many diseases. In hospital practice probably the large majority are treated as out-patients, and consequently are unavailable for purposes of observation. In 11 cases observed among in-patients in St. George's Hospital three were cases of pneumonia, three of bronchitis and emphysema, and there was one case each of rheumatoid arthritis, tabes dorsalis, renal colic, failing heart and pyrexia of obscure origin. In all these the pressure fell to normal within a week of admission, no effort having been made to directly influence the blood pressure by treatment. The temporary nature of the hyperpiesis clearly points to its having a spasmodic origin.

Ten cases have been collected in which hyperpiesis was persistent. Of these seven showed marked arteriosclerosis with or without granular kidney. The remaining three were cases of chronic parenchymatous nephritis. It is necessary to study these cases individually.

Case 1. J. A., aged 60, a married woman, admitted on March 13th, 1905, with left hemiplegia, which had come on the day before admission. There was a history of chronic alcoholism.

On examination the patient was found to be in a drowsy condition with complete paralysis of the left arm, leg and side of face. The pulse was regular, strong and of high tension, the arterial wall being much thickened. The heart was hypertrophied, the apex beat being in the fifth space four inches from the middle line. The sounds were normal except for accentuation of the aortic second sound. The urine was of low specific gravity, and contained a moderate amount of albumin.

On admission the blood pressure was found to be 235 mm. After the administration of amyl nitrate ℥iii. an immediate fall to 180 mm. occurred, but on the following day the pressure had again risen, being 245 mm.

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Venesection was then performed, ℥xvii. being withdrawn, but had practically no effect on the pressure, a fall of 3 mm. only being recorded.

From the day following admission the patient was given sodium nitrite gr. ii., potassium iodide gr. v., every four hours. On March 27th, a fortnight after admission, the pressure had gradually fallen to 175 mm. The general condition had distinctly improved, the patient being clearer in mind and without headache.

After this the patient gradually became worse again, there being increased drowsiness and headache. With the change the pressure rose, being on April 4th, 210 mm. The heart showed no sign of failure, the pulse being regular and averaging 90 per minute.

On April 10th four doses of Tinct. aconite ♏v. were given. This was followed by a fall of pressure to 110 mm., accompanied by weakness and irregularity of the pulse.

On April 14th the heart had again become regular and much stronger. The blood pressure had risen to 180 mm.

On April 16th the patient died.

Post-mortem, a large cerebral hæmorrhage was found, part of which appeared to be of recent occurrence. The heart was large with atheroma of the mitral and aortic valves. The aorta showed slight atheroma, and there was well-marked atheroma of the basal arteries of the brain. The kidneys were small and granular.

In the history of the case—one of well-marked arterio-renal sclerosis terminated by cerebral hæmorrhage—there are several points of interest:—

i. That by causing vaso-dilation with amyl nitrite we were able to produce a temporary fall in pressure, limited in extent, the pressure still remaining much above normal (180 mm.).

ii. That after a fortnight's treatment with purgatives and vaso-dilators, the fall in pressure produced, to 175 mm., was practically the same as that following the administration of amyl nitrite. This, too, with improvement in the general condition and without cardiac depression.

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iii. The great fall of pressure following depression of the heart by aconite demonstrates the possibility of reducing pressure by cardiac depression.

iv. Following the cardiac depression a recovery took place accompanied by a rise of pressure to 180 mm., the same level as that arrived at after amyl nitrite had been given.

In this case we see that while a certain proportion of the blood pressure, namely, that over 180 mm., is removable by vaso-dilators, and therefore may be regarded as spasmodic in origin, yet there still remains an increased pressure not reducible except by depressing the heart, to account for which we must seek some further cause.

It would appear that in this case a pressure of 180 mm. constitutes what may be described as an optimum pressure, *i.e.*, the lowest pressure obtainable without cardiac depression.

In this case, as in the rest of our series, the blood pressure has been taken with the patient in bed in the recumbent posture, the instrument used being of a modified Riva-Rocci pattern with a broad arm band. The readings given are those of the systolic pressure.

CASE II. W. H., aged 36, labourer, admitted on July 8th, 1906, owing to increasing dyspnœa and frequent attacks of faintness. He gave a history of syphilis, twenty years ago, lead poisoning six years ago and four previous attacks similar to the present.

On examination the heart was found to be dilated, the apex beat being in the sixth space one inch outside the nipple line and feeble in character. At the apex a systolic murmur was present, in the aortic area the second sound was accentuated. Signs suggestive of aortic aneurism were found, there being dulness over the manubrium sterni extending outwards an inch beyond it on either side, and also marked episternal pulsation. The pulse was rapid and irregular. The arterial wall was sclerosed. The urine was acid, of low specific gravity, and contained a trace of albumin. While in hospital the quantity of urine passed remained normal.

On admission the pressure was 200 mm. The patient was purged and kept in bed. At the end of ten days the pressure was 195 mm.

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During this time the heart became more regular, and the patient lost his dyspnœa while at rest, although the pulse still remained about 100 per minute, and the heart showed little evidence of decreased dilatation. On July 17th potassium iodide gr. xv. was given three times a day. At the end of thirteen days the pressure remained unaltered. On July 30th sodium nitrite gr. ii. was added to the medicine. This was followed after three days by a gradual fall in pressure. On August 6th the treatment was omitted and a daily hot water bath at a temperature of 110°F. given. From August 6th to 13th the pressure remained constant at 150 mm. The cardiac condition showed gradual improvement. On August 21st the patient was allowed to sit up in a chair. The pressure immediately rose to 200 mm., the same level as on admission.

In this case the pathological condition would appear to be one of arteriosclerosis with some degree of granular kidney.

The chief features of interest are:—

i. The inability of rest and iodides to reduce pressure.

ii. The reduction to a fixed point with nitrites and hot baths.

iii. The rapid return to the original level on getting up.

It would appear that here also a limited reduction is possible, accompanied by an improvement of the general condition and in spite of increased cardiac efficiency. But that such reduction is difficult to maintain, is shown by the rise in pressure following the patient being allowed to get up.

Case iii. J. M., aged 65. Admitted to hospital owing to shortness of breath and swelling of the legs.

On examination the apex beat was found to be in the seventh space just external to the nipple line. In the aortic area both systolic and diastolic murmurs were present. There was œdema at the bases of the lungs. The liver extended two fingers breadth below the costal margin. The pulse was irregular and dicrotic, the artery being much thickened and tortuous. The urine was acid, of specific gravity 1012, and contained a small quantity of albumin.

On admission patient was kept in bed, purged and given

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sodium iodide gr. x., liquor trinitrini ♏i. three times daily. The iodide was omitted after three days, but the liquor trinitrini was continued for eighteen. Under this treatment the pressure gradually fell from 200 mm. on admission to 140 mm. the day following the omission of the medicine. Three days later the pressure equalled 130 mm., but subsequently rose to 150 mm., at which point it remained steady.

While in hospital the condition of the heart showed very slight improvement, being always on the verge of breakdown, so that we must consider the cardiac condition as an important factor in determining the blood pressure in this case.

On studying the chart we find that a pressure of 150 mm. appears to be the minimal pressure compatible with satisfactory cardiac output.

Here also we have a case of arterio-renal sclerosis in which a limited reduction of pressure only was obtained.

Case iv. C. C., aged 44, labourer, admitted complaining of shortness of breath and swelling of the legs.

On examination the heart was found to be enlarged, the apex beat being in the sixth space, one inch outside the nipple line. The first sound was replaced by a systolic murmur.

The lungs were hyper-resonant except at the right base where there was some impairment of resonance.

The pulse was regular, 100 per minute, and of high tension. The arterial wall was much thickened. The urine was acid, of specific gravity 1015, and contained 4 per cent. of albumin. The quantity passed averaged ℥l. per diem.

While in hospital the patient gradually became worse, a pleural effusion on the right side occurring, which eventually became purulent, and he died six weeks after admission.

For the first four weeks the patient was treated with iodides and nitrites (liquor trinitrini ♏ii. and sodium nitrite gr. ii.), but with little definite effect on the blood pressure being observed, the pressure being irregular and varying between 210 mm. and 180 mm. In spite of progressive failure of strength the pressure remained very high, being a week before death, on the last occasion on which it was taken, 210 mm.

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Post-mortem, the heart weighed 25 ounces and showed much hypertrophy of the left ventricle. Much atheroma of the aorta and large arteries was present. The kidneys weighed 5 oz., and were highly granular.

In this case we have a typical example of arteriosclerosis and granular kidney in which no definite reaction to anti-spasmodic treatment was obtained. The hyperpiesis also showed a remarkable constancy in spite of progressive failure of the general strength.

CASE V. J. L., aged 58, engine driver. Admitted complaining of shortness of breath. On examination the heart was found to be hypertrophied with accentuation of the aortic second sound.

In the lungs diffuse râles were heard and there was impaired resonance at the right base.

The pulse was 110, regular and of high tension, with much thickening of the vessel wall. The urine was acid, of specific gravity 1015, and contained a trace of albumin. The average quantity passed per diem was ℥l.

A week after admission the patient showed some improvement, the heart being slower and there being less dyspnœa. After this the condition remained stationary for a few days and then gradually grew worse, the patient dying seven weeks after admission. During the first week the patient was purged and given potassium iodide gr. v., liquor trinitrini ♏i. three times a day. Under this treatment the pressure showed a slight fall only from 190 mm. to 180 mm. After this, owing to the general condition, the treatment was changed, cardiac stimulants and expectorants being given. In spite of these the heart gradually failed and at the same time the pressure fell, the daily readings varying between 160 mm. and 130 mm.

Post-mortem, the lower lobe of the right lung was in a condition of grey hepatisation. The heart weighed 22 oz., and showed much hypertrophy of the left ventricle. Well-marked aortic atheroma was present. The kidneys weighed 7 oz., and showed some diminution of the cortex, but there was no definite naked eye evidence of sclerosis.

In this case, one of arteriosclerosis without an advanced

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degree of renal sclerosis, we find that treatment with vaso-dilators produced little effect on the pressure. This subsequently fell with the failure of the heart, but even with the heart in a failing condition it remained above normal.

CASE VI. F. P., aged 58, admitted owing to abdominal pain. On examination there was found to be an aneurism of the abdominal aorta. The pulse was slow and regular with much increased tension, the arterial wall being markedly thickened and tortuous. The heart showed some hypertrophy, the apex beat being in the fifth space in the nipple line and being of a thrusting character. The sounds were normal except for accentuation of the aortic second sound. The urine was acid, of specific gravity 1020, and contained no albumin.

While in hospital ordinary diet was given except for a short period during which both solids and fluids were restricted. This, however, was badly borne, and a return was made to ordinary diet. Sodium iodide gr. x. and potassium iodide gr. v. was given three times daily, and the patient was freely purged. Under this treatment the pain was to some extent lessened, although the aneurism showed no signs of decreasing in size. During the four weeks the patient was under observation the blood pressure remained at the same level as on admission, *i.e.*, at 180 mm. The pulse remained slow and regular, the heart being fully competent. On no occasion was albumin found in the urine.

In this case we have arteriosclerosis without evidence of renal disease, accompanied by a hyperpiesis of a remarkably constant character, on which treatment by rest, purgation and iodides was without effect.

CASE VII. J. H., aged 61, a coachman, admitted owing to increasing shortness of breath, which had been coming on during the last three months.

On examination, the lungs were hyper-resonant, a few coarse râles being present at both bases. The heart's apex beat was in the fifth space just inside the nipple line, the anterior cardiac dulness being reduced in size. The sounds except for accentuation of the aortic second sound were normal.

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The pulse averaged 80 per minute, and was regular except for the occasional omission of a beat, the tension being increased. The arterial wall was thick and tortuous.

The urine was acid, of specific gravity 1020, and contained no albumin or sugar.

While in hospital the patient had no dyspnœa. The heart became quite regular, the urine continued normal and was passed in normal quantities. For the first nine days patient was kept in bed, and after that was allowed to get up daily.

The treatment employed consisted of purgation, sodium iodide gr. v., potassium iodide gr. v. three times daily and a hot bath daily. The blood pressure for the first seven days showed some irregularity varying between 160 mm. and 185 mm. In the second week the pressure remained more constant, remaining between 165 mm. and 150 mm. No definite reduction can be said to have been effected, the pressure on the day following admission being 170 mm. and on the last two days it was taken, 160 mm.

In this case of emphysema and arteriosclerosis, as in the last case, we have no evidence of renal disease. In both also the heart was fully competent.

In this series of seven cases which we have just described, all showed arteriosclerosis. Four also showed well-marked renal sclerosis. In the fifth, renal sclerosis was present to a slight degree only. In the sixth and seventh no evidence of renal disease was found.

Of the four cases where renal sclerosis was well marked, three showed a definite reduction of pressure under treatment. In the fifth case, that with a slight degree of renal sclerosis, the pressure was only reduced through 10 mm. In the last two cases where no renal disease was present no reduction was obtained. In no case was a reduction to the normal pressure obtained except by cardiac depression.

We see then that in cases of arteriosclerosis and granular kidney we can reduce pressure by anti-spasmodic treatment to a limited degree only in the most favourable instances, the exact amount varying in different cases. We conclude therefore that

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there is some cause of increased resistance other than spasm of the arterioles for which we must look.

As to the nature of this second cause we know that we have arterial degeneration present, leading to loss of elasticity and roughening of the arterial wall. It would appear probable that this might mechanically produce an increased resistance.

Further, after the spasmodic element has been reduced to a minimum by treatment, the constancy of the pressure remaining points to a permanent unaltering cause, such as arteriosclerosis.

We cannot, however, exclude increased viscosity of the blood as a possible factor in causing this increase of resistance.

It is noticeable that in our series of cases where arteriosclerosis and granular kidney were both present, in three out of four cases, a definite reduction of pressure was obtained. On the other hand, where arteriosclerosis alone or with but slight renal sclerosis was found, no reduction was obtained. It would appear therefore that where renal sclerosis is present there is frequently a definite spasmodic element in the increased pressure.

The remaining three cases which we have to describe are cases of chronic parenchymatous nephritis.

CASE VIII. F. S., aged 38, admitted complaining of headache and vomiting. Patient had previously five similar attacks in the last two years.

On examination patient was found to be in a drowsy condition, with somewhat puffy face and a furred tongue. The heart showed some hypertrophy, the aortic second sound being accentuated. The pulse was 78, strong and regular and of very high tension, the radial artery being slightly thickened. There was slight œdema of the ankles. Occasional twitching of the fingers were observed. The urine was acid, of specific gravity 1015, and contained a large quantity of albumin. While in hospital the amount passed averaged ℥xxxv. per diem, the amount of fluid taken being ℥l.

The patient was vigorously purged, and had a hot air bath daily at a temperature of 110°F. Sodium iodide gr. x., potassium iodide gr. v., sodium nitrite gr. ii. were given every six hours. Under this treatment the headache became less, and

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the vomiting ceased. The patient left the hospital at his own request nine days after admission in a considerably improved condition, though still far from well.

During this time the pressure fell from 250 mm. to 190 mm. On two previous occasions when in hospital for attacks of a similar nature, under the same treatment a like reduction was obtained, the pressure being reduced on one occasion from 250 mm. to 190 mm.; on the other from 230 mm. to 190 mm.

It is to be observed:—

i. That on admission the patient was in a condition bordering on uræmia.

ii. That under treatment a reduction of pressure occurred, accompanied by a disappearance of uræmic symptoms.

iii. That in similar circumstances the pressure fell on three separate occasions precisely to the same level, namely 190 mm.

It would appear that for this patient 190 mm. constituted what we have described as the optimum pressure, and that with the onset of uræmia there was a tendency for the pressure to rise above this, the said rise being due to spasmodic causes.

Case ix. A. B., a Lifeguardsman, aged 39, admitted owing to swelling of the legs and abdomen.

On admission the patient was in a condition of orthopnœa. There was general œdema, most marked in the lower extremities. The peritoneum contained a large quantity of fluid, and there was dulness at the bases of both lungs. The heart was dilated, the apex beat being in the fifth space, two inches outside the nipple line. At the apex the first sound was reduplicated, and in the aortic area there was accentuation of the second sound.

The pulse averaged 100 per minute, and was sometimes weak and at times irregular. No change in the vessel wall was perceptible. The urine was of high specific gravity, and contained a large quantity of albumen. While in hospital the fluid taken was restricted to Oii. daily. The daily amount of urine averaged ℥xxv.

The ascites and œdema of the legs increased, necessitating paracentesis of the abdomen and incision of the legs. By this

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means the patient was greatly relieved. The condition of the heart showed little alteration, the patient still being breathless on the least exertion.

The treatment employed consisted in daily hot air baths, free purgation, potassium iodide and sodium nitrite or liquor trinitrini. But neither the general condition or the blood pressure showed any marked reaction to treatment. In the seven weeks during which the patient was under observation the pressure, which on admission equalled 170 mm., varied between 190 mm. and 150 mm., it being again 170 mm. on the last two days on which it was taken.

CASE X. H. H., aged 17, admitted owing to swelling of the face and legs, which had come on a fortnight previously. There had been no headache or vomiting. The patient gave a history of tonsillitis and bronchitis three weeks previously.

On admission there was much œdema of the face, hands and legs. The heart was normal. The pulse slow, regular and strong. The urine contained much albumin, casts and a small quantity of blood. During the first month in hospital the urine was passed in less than normal quantity, but after this it increased to about the normal amount.

The patient was under observation six months. During the first four and a half months the condition remained little altered, there still continuing to be much œdema. The treatment employed consisted of hot air baths daily, purgation and sodium nitrite. During the first three months the pressure remained almost constant at 140 mm. In the fourth and first half of the fifth months the pressure varied between 150 mm. and 160 mm. At the end of this time the legs were incised, a large quantity of fluid being drained away by this means. The incision healed slowly, and a daily loss of fluid from the legs occurred and was still continuing at the end of the sixth month. Following the incision of the legs the pressure gradually fell, and at the end of thirteen days became normal, at which level it remained. The general condition showed marked improvement.

Of these last three cases, the first shows considerable differences from the two following, in that in it toxic symptoms

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were prominent, œdema being slight. Under treatment a definite reduction was effected, although the pressure still remained very high. Further, this case showed uræmic symptoms. In the other two cases, on the other hand, there was much œdema, and toxic symptoms were slight only. In these anti-spasmodic treatment gave no result. It would appear therefore that the spasmodic element in the increased pressure shown in the first case is attributable to the presence of those toxic products which also cause uræmia. We have yet to explain the residual increased pressure in this case and the total increased pressure in the other two. We cannot fall back on arterial changes as a likely cause as we have no evidence that such are present. The fall of pressure following the relief of œdema by draining the legs, as occurred in the last case of the series, suggests that œdema and high pressure are closely connected. On the other hand, in chronic nephritis high pressure may be present without œdema. Also in three cases of this nature which were under observation, and in which much œdema was present, the pressure remained normal.

All we can say is that œdema is a sign of an altered condition of the tissues in which the blood must also be affected. It is possible that these changes in the blood may increase its viscosity and thus lead to increased pressure. It may be that by mechanically relieving œdema we help to restore the blood and tissues to a normal condition and thus bring back the blood pressure to normal.

To return now to the primary object of our inquiry, namely, as to whether hyperpiesis has any compensatory action. We have seen that temporary hyperpiesis occurs in various conditions, disappearing rapidly with general improvement of the patient and irrespective of specific treatment. We conclude that such hyperpiesis is due to spasm of the arterioles. In these cases, when return to health is accompanied by a return to normal pressure, it is hard to believe that hyperpiesis is anything but a vicious effect due to vaso-constriction by circulatory toxins. We cannot therefore consider it to be in any way compensatory.

In persistent hyperpiesis, on the other hand, although we cannot lay claim to have in any way elucidated the actual cause

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of hyperpiesis, yet we have attempted to show that to arteriolar spasm we can attribute at most but a small proportion of the increased resistance, and that we must look to more permanent causes, such as alteration in the vessel walls and in the viscosity of the blood. These alterations in the circulatory system we do not at present know how to remove. Potassium iodide is stated to have some action in decreasing the blood viscosity, but, as we have seen in the cases examined, its action was not attended by marked success in reducing pressure.

We have therefore to resign ourselves to a condition of the circulation definitely modified by a permanent increase of peripheral resistance. To overcome this we must obviously have an increased blood pressure, the increase being compensatory to the increased resistance. In these cases therefore we may regard hyperpiesis to be truly compensatory and to be beneficial to the general condition by ensuring an efficient blood supply to the tissues.

Conclusions.

We find that:

i. Hyperpiesis is due to increased peripheral resistance.

ii. The possible causes of increased peripheral resistance are (*a*) arteriolar spasm; (*b*) changes in the vessel walls; (*c*) increased viscosity of the blood.

iii. Clinically, cases of hyperpiesis may be divided into temporary and persistent.

iv. In temporary hyperpiesis the increased resistance is due to arteriolar spasm. It serves no useful purpose, and cannot be regarded as being in any way compensatory.

v. With persistent hyperpiesis definite organic lesions of either the arteries or kidneys are present.

iv. In cases of arterio-renal sclerosis a limited reduction of pressure only is obtained by anti-spasmodic treatment. From this we conclude that there is some other cause of increased resistance present besides spasm of the arterioles. The presence of arteriosclerosis in all cases suggests the probability of vascular changes being the cause sought for.

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vii. In chronic parenchymatous nephritis the reaction to treatment varies. In one case, when uræmic symptoms were present, a limited reduction was obtained. In two cases without uræmic symptoms neither showed any reaction to anti-spasmodic treatment; in one, however, the pressure fell to normal after the relief of œdema by incision of the legs.

viii. In chronic parenchymatous nephritis, as in arterio-renal sclerosis, spasm of the arterioles can account for at most but a small proportion of the increased pressure.

ix. The most important factor in the increased pressure is increased viscosity of the blood.

x. In cases of persistent hyperpiesis we are not able to remove the causes of increased resistance. We must therefore have a compensatory increase of blood pressure.

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CHRONICLE.

Medicine.

Palpation of the Stomach.

HAUSMANN (T.) *Arch. f. Verdauungskr.* 1907. Vol. 13, p. 394.

THE writer regrets that more attention is not paid to the palpation of the abdomen in the diagnosis of disease. He claims that of his last 500 cases, he has felt the pylorus in 18 % and the greater curvature in 25 %. For palpation the hands must first be laid flat on the abdomen and with each expiration gentle increased pressure should be applied till the spinal column is felt. The patient should now be made to breathe deeply, and during an expiration the fingers should be drawn a short way downwards pulling with them the underlying skin of the abdominal wall. Then the fingers are slid downwards one after another over the skin to the lower position. By repeating this manœuvre and gradually passing downwards the deep organs can be palpated, and do not slip away by a relaxation of pressure.

The pylorus can be distinguished by the change of consistency due to the rhythmic contractions which occur in it. These take place both when the stomach is full and empty, and vary much in different individuals; in some cases the pyloric contractions may be nearly absent and in others almost constant. But the pylorus may be felt in relaxation as well as in contraction. The greater curvature may be made out even more frequently than the pylorus. As the finger passes over the edge there may be a feeling of slipping over a step, and as the finger is cautiously drawn downwards to approach the lower edge of the stomach some of the fluid in the small remaining portion of the stomach which is cut off may pass to the larger upper part with a gurgle. The passage of a soft sound which will follow the greater curvature and be palpable from outside may be used to show the lower limit of the stomach. Distension with gas changes the position of the lower border too much to demonstrate its original position. It is, however, one of the best methods of showing the lesser curvature. The transverse colon may at times be palpated. The following points help to distinguish it from the pylorus and stomach; it may be moved passively up and down; there are no frequent and marked changes of consistency; and it can be felt as a cylinder of greater length than the combined pylorus and greater curvature. The pancreas is

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the most difficult abdominal organ to palpate, and in most cases where it has been thought to be detected it is the colon which has really been felt.

The writer gives a full account of several cases with diagrams where skilled palpation has cleared up the diagnosis of a case, which otherwise could not be explained. E. B. LEECH.

On Gastric Ulcer with especial reference to Pylorospasm and Hypersecretion.

BEST (F.) *Muench. med. Woch.* No. 27.

THE writer recalls the great variability of the symptoms attending gastric ulcer and the uncertainty of the clinical signs. Symptoms are most marked when ulcer is associated with motor disturbances, atony, or abnormalities in the form and position of the stomach. It must be remembered, however, as the work of His has shown, that great variations are met with in the size, shape, and position of the stomach within anatomical limits; such abnormalities only become pathological when they lead to functional disturbance, particularly of motility. Amongst the influences tending to prevent healing of a gastric ulcer Tecklenburg has emphasised atony and air-swallowing, to which the writer adds proximity to the pylorus for obvious reasons. Even when healing proceeds by cicatrization the conditions for a new series of disturbances are present, viz., pylorospasm. In favourable cases the contracted pylorus may be palpated and the patient may complain of a cramping sensation, though the spasm may give rise to little pain till the obstruction has led to considerable gastrectasis or to spasmodic action of the stomach. When spasm occurs the pylorus, already narrowed by cicatrization, becomes completely closed, the retained gastric contents excite the base of the ulcer to increased secretion, and stagnation of the chyme, increased secretion of gastic juice and reflex salivation lead to still greater dilatation. In this dilatation the base of the ulcer participates and pain and hæmorrhage result. The history of these cases bears out this conception, for after a period of remission of longer or shorter duration, during which one is tempted to regard the ulcer as healed, the symptoms return, and it may be erroneously supposed that a new ulcer has developed. This sequence of events may recur periodically over a number of years. These attacks begin with acidity, heartburn, then retching and eructation, and lastly vomiting of copious material. The vomit is chiefly liquid with a sediment of solid particles which are mostly of carbohydrate nature and especially vegetable remnants. The liquid is often colourless or whitish, and later of a greenish colour. It is often brown or "coffee-grounds," but blood in any great quantity is rare. The fluid consists of gastric juice containing hydrochloric acid, which in one case amounted to 1·8 per cent.

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The characteristic picture is thus presented of pylorospasm and hypersecretion on the one side, and on the other motor insufficiency and dilatation. A vicious circle is thus established.

The treatment of ulcer at the pylorus is gastro-enterostomy, particularly for the wage-earner; medical treatment may yield considerable improvement, but not a cure.

In conclusion, he emphasises the unfavourable influence of air-swallowing, which he has found to be present in more than half his stomach cases.

G. R. MILL.

Case of Peripheral Hypoglossus-Paralysis with Hemiatrophy of the Tongue.

BAUMGARTEN (A.) *Wien. med. Woch.* 1907. No. 31.

A GIRL, aged five, had been operated on for cervical adenitis at eighteen months. Directly after the operation the mother had noticed deviation of the tongue and impairment of speech. On examination, the left face was rather flatter than the right and the left pupil very slightly larger than the other. The tongue at rest pointed to the right, and, when protuded, to the left. The left half was shrunken, transversely furrowed and showed fibrillary twitching. Active movements of the organ were unimpaired and sensation of all kinds was equal on the two sides. The electrical reactions were normal. Stimulation of the left hypoglossal in the neck gave no response, but when the right nerve was stimulated contraction occurred in both halves of the tongue. The larynx in deglutition inclined to the right and the left anterior pillar of the fauces was higher and narrower than the left.

These signs pointed to a lesion of the nerve below the junction with branches from the 2nd and 3rd cervical. Noteworthy features were the elevation of the palate on that side, the absence of a reaction of degeneration, and the bilateral response on stimulation of the nerve on the sound side. The absence of R.D. was probably accounted for by the time which had elapsed since the injury. The elevation of the palate might have been due to developmental anomaly, or possibly to absence of the normal pull of the lingual muscles on that side. Hyrtl's investigations have shown a communication between the two Hypoglossi above the hyoid, hence probably the bilateral response referred to.

Of 79 cases of hemiatrophy of the tongue collected by Ascoli, only 28 were attributed to peripheral lesions of the nerve. Of 17 more recent cases, 3 were post-operative, 2 due to trauma, 2 to Pott's disease in the suboccipital region, 1 to recurring pharyngitis with adenitis, 1 to pharyngeal phlegmon, and 1 to neuritis during typhoid, the causes in the other cases not being stated.

G. R. MILL.

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The Diagnosis of Addison's Disease.

GRÜNBAUM (OTTO). *The Practitioner*, August, 1907.

IN this disease marked lesions of the medulla of the suprarenal gland are usually found at the autopsy, but in some apparently typical cases these glands prove to be healthy, not only upon macroscopic and microscopic examination, but also when tested physiologically as to the potency of their extract. The author explains these cases as due to disease of the solar plexus, such as has been noted in several cases. He believes that the medulla of the suprarenal gland has an internal secretion which acts by stimulating the sympathetic system, and it is therefore legitimate to assume that the same train of symptoms will follow when either the necessary stimulus of the suprarenal gland is absent or the sympathetic tissue itself is diseased. To explain the non-occurrence of Addison's disease in cases where the autopsy has revealed marked destruction of the medulla of the suprarenal glands he believes that the duties of the glands may be in some cases assumed by the series of cells, termed chromaffine cells from the fact that they yield a yellow colour on treatment with chromic acid. These cells develope along with the sympathetic nerves in the abdomen in some immature animals, and injection of extracts of these cells produce exactly the same effect as injection of an extract of the medulla of suprarenal gland. The author suggests that these cells assume the function of the suprarenal gland in the same way as the parathyroid glands take over the function of the thyroid gland after its extirpation. The author discusses the character of the pigmentation met with in the disease, and mentions the other conditions in which a similar pigmentation may occur and the points of difference. As regards asthenia, the ergograph method of diagnosing the disease has proved disappointing to the author. The height of blood pressure as measured by the Hill and Barnard sphygmomanometer has been, however, of value; but of even more value was the method of taking the blood pressure before and after the administration of suprarenal gland in 3 gr. doses for three days. If a rise of blood pressure of more than 10 per cent. occur, the probability that the patient is suffering from adrenalin insufficiency approaches a certainty. The author also attaches some weight to the determination of the opsonic index for tubercle bacilli, particularly as noting the duration of the negative phase following the administration of a five-hundredth of a milligram of tuberculin. E. N. CUNLIFFE.

Observations upon Arthritis in Young Children.

POYNTON (F. G.). *Edin. Med. Journ.*, September, 1907.

THE following varieties of arthritis are met with in children:—

1. *Gonococcal Arthritis.* These cases usually arise in the

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first three months of life, the primary focus being a purulent ophthalmia. The knee-joints are most frequently attacked and although the condition of the joint is so severe and acute as to suggest suppuration, such an occurrence only takes place in case of secondary infection by some other pyogenic micro-organism.

2. *Virulent Septic Arthritis.* Virulent streptococcal and staphylococcal infections are mainly responsible for these cases which may occur in connection with general pyæmia or in association with some focal condition generally an acute epiphysitis of one of the bones entering into the formation of the affected joint.

3. *Meningococcal Arthritis.* These cases are rare but occur in connection with cerebro-spinal meningitis and with post-basic meningitis. The arthritic complication is usually a secondary event of little moment but details are given of two cases where the cerebral symptoms were slight and the joint condition formed the striking event in the illness. The affection may be polyarticular, and usually the swelling is periarticular rather than intra-articular and sometimes pain is very slight.

4. *Acute Tubercular Arthritis.* Rare cases are met with where tubercular infection of a joint leads to a fleeting inflammation characterized by sudden and rapid swelling of a joint and as sudden and rapid a disappearance of the effusion.

5. *Pneumococcal Arthritis.* One would expect to meet with this condition frequently in children. Apart from the arthritic pains met with in the early stages of severe cases of lobar pneumonia, it is rare to have the joints involved, though isolated cases have been reported. There is a decided tendency for the affected joint to suppurate.

6. *Acute Rheumatism.* The condition is rare in young children and infants but where present may prove rapidly fatal. It runs a more irregular course than in adolescence. Arthritis may be an initial symptom, and was noticed in the majority of the thirty cases observed by the author in children under five years of age.

7. *Arthritis of the type described by Still.* Girls are more frequently affected by this disease than boys. The onset is generally gradual and is usually noticed in the first three years of life. The striking features are—(1) a chronic progressive arthritis of the periarticular type affecting the wrists, knees and spine and characterized by absence of bony changes and no tendency to suppuration; (2) enlargement of the spleen; (3) enlargement of the lymphatic glands especially the supra-trochlear, brachial, axillary and those in the iliac fossæ and posterior triangles of the neck. The etiology is obscure and the author does not think that Still's suggestion that these cases are tubercular is applicable to all cases and he describes an interesting case of the disease occurring in a child of rheumatic parentage and associated with advanced heart disease.

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8. *Arthritis associated with Hæmophilia.* In this disease the joints may be affected in two ways:—

1. Arthritis deformans may occur as a result of hæmorrhage into the joints. The author has not observed this under the age of five.

2. Infective arthritis may occur in hæmophilics under the age of five. Such illnesses may prove fatal with high temperature, external hæmorrhages and enlarged lymphatic glands yet post-mortem no trace of hæmorrhage into the joint is found, merely a condition such as one meets with in acute rheumatism.

9. *Congenital Syphilis.* The joints are rarely affected under the age of five though rare cases have been reported where gummatous infiltration of the synovial membranes has been found in infants. Syphilitic epiphysitis, on the other hand, usually begins in the first year of life, and often in the first six months, and may be multiple and produce separation of the epiphyses. Such cases may be mistaken for arthritis but recognition of other signs of syphilis and the employment of skiagraphy will usually lead to a correct diagnosis.

E. N. CUNLIFFE.

The Etiology and Pathogenesis of Infectious Arthritides of Urinary Origin.

BODIN (GORGES). *Amer. Jour. of Urology*, August, 1907.

THE predisposing causes of arthritides of urinary origin comprise general conditions, such as cold, exhaustion, and the arthritic diathesis. The essential factors in their production are, however, a change in the urethral or vesical mucosa and urinary infection. The function of the epithelium is to prevent the absorption of deleterious material, and if the epithelium is removed, either by trauma or by dissolution the result of ammoniacal fermentation of the urine, opportunities for absorption are afforded. Normal urine is inoffensive, and it is only when micro-organisms have established themselves that harmful effects result. A variety of micro-organisms have been found to be pathogenetic in producing arthritides, but the most important is a micro-organism closely related to bacterium coli communis. It has been shown that the bacterium coli does not exist in a normal healthy individual in the urethra, though it is frequently found about its entrance, and when infection occurs it must necessarily be the result of introduction of the micro-organisms usually by instruments. That the bacterium coli in a modified form is the cause of arthritides has been proved by demonstration of the organism in the joints. The arthritis may be of the suppurative or non-suppurative type. Bacterium coli will produce suppuration if attenuated, and Courmont has shown that synovial membranes are the soil of predilection for attenuated infections. But not only the actual micro-organism may cause

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arthritis, but also the toxins formed by its activity. It has been generally conceded that during diphtheria serous arthritides and periarthritides occur, due to the toxins produced by Löffler's bacillus, though no bacteria are present in the fluid or tissues of the joint, and there seems no room to doubt that in cases of urinary infection the micro-organism may not infect the system, but locally produce toxins the absorption of which results in arthritides. The author is of opinion that not only the colon bacillus but also the gonococcus, tubercle bacillus and other micro-organisms may produce joint affection, either by actual invasion of the joint by the micro-organism or due to the absorption of toxins.

E. N. CUNLIFFE.

Report of a case of Polyarthritis due to Staphylococcus Aureus—a contribution to the study of the part played by habit in determining the localisation of microbic infections.

RIBADEAU-DUMAS (L.) and DE JONG (S.-I.). *Gaz. des Hôpitaux*, September 3.

DETAILS are given of a case where a synovitis of the perineal tendon sheaths due to infection by staphylococcus aureus through a wound was followed by purulent arthritis of several joints, the micro-organism in all cases being staphylococcus aureus. The authors proceed to discuss the determining factors in 'pseudo-rheumatic' affections of the joints. Previous injury of the joint is sometimes a predisposing factor, as, for instance, where microbic infection occurs in a gouty or rheumatic joint. A more important factor is attenuation of the micro-organism, for there is abundant evidence to prove that attenuated micro-organisms have a preference for synovial membranes. The micro-organisms may be of attenuated virulence or the infected subject may be in a state of relative immunity. The object of the present paper is, however, to support the contention of Bezançon and Labbé to the effect that when a micro-organism has dwelt in a tissue and produced pathological lesions it acquires a certain tendency to localise itself in a similar tissue. Numerous observers have substantiated this opinion. The localisation of microbes depends not on an inherent specificity but on an acquired tendency.

E. N. CUNLIFFE.

Subcutaneous Rupture of the Spleen.

ELIOT, Jr. (ELLSWORTH). *New York Med. Journ.*, July 13, 1907.

THIS paper is concerned only with consideration of cases where, at the time of rupture, the spleen was, as far as could be ascertained, healthy. The diagnosis and treatment of the condition are considered. As regards treatment, splenectomy is

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certainly indicated. The only possible objection that could be brought against this procedure would be that the spleen is an organ of importance to the economy and that its removal is followed by baneful effects. Cases are recorded where perfect health has followed removal, whilst, on the other hand, cases of anæmia and impaired repair of lesions, especially of the long bones, have been reported. The writer gives full details of two cases where splenectomy was performed. In the first case the after history was one of perfect health. In the second case, however, an attack of cholecystitis nearly caused death, and apparently the vitality of the patient seriously suffered by removal of the spleen.

E. N. CUNLIFFE.

The presence of Tubercle Bacilli in Tubercular Nephritis.

EKEHORN (G.). *Arch. für klin. Chirurg.* Band 84, Heft. 4, p. 1022.

THE author shows that bacilli are frequently present in large numbers in the urine at a period when the disease is recent and not wide-spread.

Moreover, when fresh papillary apices become involved there is an increase in the number of bacilli in the urine. A large quantity of pus in the urine is apt to mask the presence of the organisms.

One can more or less judge of the probable condition of the kidney from examining the urine. Definite clumps of bacteria always suggest a renal origin rather than vesical or ureteral, and such are usually found when there is a necrotic change present. If there be much pus and few bacteria, there is then an old cavity with thick fibrous walls. If the pus is only slight and the organisms are present even in large numbers, the disease is presumably superficial and recent.

LAWRENCE JONES.

Acute Anterior Poliomyelitis or Acute Spinal Paralysis of Children.

COLLINS (JOSEPH). *Medical Record,* November 2nd, 1907.

THIS paper is a preliminary report upon an epidemic of acute anterior poliomyelitis occurring in New York during the months of August and September, 1907. About 200 cases were seen in these months at the Hospital for the Ruptured and Crippled alone. The age of the great majority of the patients was from one to three years, and very few exceeded that of four years. There appears to be no ground for attributing the onset of the attack either to heat or to insanitary conditions: the summer was a cool one, and the cases came from all parts of the city

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indiscriminately. In only 14 was there a history of marked digestive disturbances, such as diarrhœa, vomiting or stomachic or intestinal indigestion. In four instances more than one member of a family was affected. The noteworthy feature of the epidemic was the considerable percentage of cases which ended in a fairly good recovery, that is, without any permanent atrophy of muscles. Yet, that the epidemic was not a mild one is shown by the large number in which the medulla and pons were involved. The actual number of cases in which recovery took place is not stated, and a further communication on the subject is promised. The author urges that lumbar puncture should be carried out in all cases which, from the premonitory and early symptoms, appear to be possible instances of anterior poliomyelitis, and further that bacteriological examinations should be made of the urine and fæces with the idea of obtaining information as to the pathology of the disease.

JAS. W. RUSSELL.

Ichthyismus Choleriformis.

ROEPKE (O.). *Arch. f. Verdauungskr*, 1907. Vol. xiii., p. 368.

THREE types of ichthyismus or poisoning from eating unsound fish, are recognised according as the symptoms are mainly nervous, exanthematous or digestive. An outbreak is described of the last, the so-called choleriform type which occurred in a sanatorium for tuberculosis. Of 139 patients and staff, all of whom had partaken of a meal of haddock, 43 were affected in varying degrees, five of these severely, but with no fatal results. The following facts were brought out:—There is evidently a marked idiosyncrasy, for the symptoms were not in proportion to the amount of fish taken. Symptoms arose from two to forty hours after the meal. Severe headache and diarrhœa were present in all cases; the former was generally the earliest symptom; the diarrhœa, which was very acute, ceased in most cases in a few days, but in some persisted for several weeks. The temperature frequently reached 102°, and in one severe case rose to 105°; in most cases it rapidly fell to the normal. General body pains were frequent, and there was in many cases abdominal tenderness. Vomiting occurred only rarely. The pulse was slow, and was singularly little disturbed in view of the general malaise. The spleen and liver were not enlarged.

The symptoms are due to a decomposition, probably bacterial. In this instance the fish had been caught before October 1st, and was not eaten till October 5th. It was, however, absolutely normal in appearance, smell and taste. Owing to the fish having been completely consumed no bacterial or chemical examination was possible. In no case was the tuberculosis from which the patients were suffering deleteriously affected by the poison.

E. B. LEECH.

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Acute Dilation of the Stomach.

MORICHAU-BEAUCHANT (R.). *Gaz. des Hop.*, August, 1907, p. 1131.

A CASE is reported in a man aged 57 who had had gastric attacks off and on for 30 years. In the last there had been emaciation and collective vomiting. The disease was diagnosed as chronic dilatation of the stomach due to pyloric stenosis following gastric ulcer. The onset of the acute dilatation was quite sudden. There was the usual vomiting of large quantities of brown fluid. The stomach was very large. Tetany was present all over the body and most marked in the legs. The patient died on the second day. The stomach and duodenum were found at the post-mortem examination to be enormously distended; there was a cicatrix at the pylorus leaving a lumen only the size of a pencil. Unfortunately the nature of the dilatation was not recognised at the autopsy, and so the careful examination that would otherwise have been made was not carried out. One gathers from the account, however, that there was marked dilatation both above and below the stenosed pylorus and this cannot, therefore, have played the part often ascribed to the mesenteric arteries.

A general account of this rare disease is next given; the writer considers that a toxic paralysis is probably the primary lesion and does not consider that an increased pressure due to the mesenteric vessels is enough to account for the dilatation. He believes that the essential part of the treatment is the emptying of the stomach two or three times a day by means of the stomach tube.

E. B. LEECH.

Determination of the lower border of the Stomach in Motor Insufficiency.

VON SIEVERT (A.). *Arch. f. Verdauungskr.*, 1907. Vol. xiii., p. 329.

THE following are the most convenient methods of determining the boundaries of the stomach: (1) Palpation by means of splashing; (2) the use of the phonendoscope; (3) percussion after moderate distension with CO_2 gas. For this purpose 30 grains of sodium bicarbonate and 15 grains of tartaric acid should be used; a greater distension than is caused by these amounts gives a wrong idea of the size of the stomach.

The writer gives his measurements to the right of the middle line for the right border, and above or below the umbilicus for the lower border. In normal cases he finds that the average distance of the right border from the middle line is 6 cm., and of the lower border above the umbilicus is 2—5 cm. Where there is diminished emptying power with dilatation an average

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distance is 9 cm. to the right, and it is common in these cases for the lower border to be below the umbilicus, but the extra distance to the right is a more certain sign of dilatation than is the displaced lower border.

E. B. LEECH.

The Thalamic Syndrome.

DEJERINE (J.). *Gazette des Hôpitaux,* July 25th, 1907.

AFTER describing an illustrative case, the author reviews the symptoms produced by a vascular lesion of the optic thalamus. As a rule, slight hemiplegia is observed at the outset, coming on without loss of consciousness either suddenly or in the course of a few hours. It is accompanied by neither contracture nor exaggeration of reflexes, and rapidly passes off. Occasionally paralysis may be absent altogether. The prominent and persistent symptoms are on the sensory side, and consist at first of a hemianæsthesia, most marked at the periphery of the limb, and especially affecting deep sensibility, with resulting loss of sense of position and stereognosis. Frequently there is an accompanying hyperæsthesia, when slight pinching of the skin or the contact of moderate heat will cause excessive pain. Later in the course of the illness, paroxysmal pains develope in the affected side, always severe, sometimes almost intolerable, and unrelieved by the coal tar derivatives or other drugs. These pains are characteristic and persistent, and constitute the worst feature in the prognosis. Ataxia on the affected side, involuntary choreiform movements and athetosis are also characteristic of the lesion.

There is thus a marked contrast between the thalamic syndrome and the symptoms of a lesion of the internal capsule. In the latter the hemiplegia is prominent and persistent, and is accompanied by exaggerated reflexes; the hemianæsthesia is slight and fleeting, and at the worst there are but vague pains, often situated in the limbs, and generally associated with contracture. There is neither athetosis nor ataxia. In hysterical hemianæsthesia the affected limbs are uniformly involved, and there is not the characteristic dimunition of the anæsthesia from periphery to base. The loss of sensation is superficial, there is no ataxia or athetosis, and hemiplegia is often absent. Hemianæsthesia may also occur in lesions of the bulb or peduncle. In the so-called syndrome of Weber, it may be accompanied by involuntary choreiform movements and athetosis; but the diagnosis is made clear by the presence of crossed third nerve paralysis. Ocular paralyses are also present in lesions of the corpora quadrigemina. In both these cases there is definite involvement of the pyramidal tract, evidences of which are wanting in uncomplicated lesions of the optic thalamus.

The paper ends with a brief review of the anatomical relations

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of the thalamus, in which support is given to the view that the sensory fibres passing from the thalamus to the cortex end in the ascending parietal convolution.

J. W. RUSSELL.

Intracranial Tumour and its Treatment.

LESZYNSKY (WILLIAM M.). *Medical Record*, July 13, 1907.

AFTER a brief review of some of the main difficulties met with in the diagnosis and localisation of brain tumours, the author discusses the various methods of treatment available. If syphilis is suspected or known to exist, benefit may be obtained from mercury and iodides, although these are often of but little use even when the tumour is a syphilitic gumma. It must be remembered, however, that other forms of tumour, especially sarcoma, may respond temporarily to anti-syphilitic treatment, and that remissions in the symptoms may occur spontaneously. The various coal tar products will sometimes give relief to the headache, as may ergot or morphia administered subcutaneously, and also free purgation. The withdrawal of cerebro-spinal fluid by lumbar puncture often increases the headache; it is usually of no benefit, and may cause danger to life if a large quantity of fluid is removed. Failing relief from the foregoing measures, operation is often necessary, even though localisation of the tumour is impossible. When operation is performed for the permanent relief of intracranial pressure, and the tumour is either inaccessible or not localised, the point of selection is usually over the right temporal region if the patient be right-handed, if left-handed the opposite temporal region should be chosen. Any sign of impairment of vision must be accepted as an imperative indication for operation, for if this be delayed until serious impairment has taken place optic atrophy and blindness will be the certain result. In doubtful cases, however, and especially when a cerebellar growth is suspected and when vision is not affected, surgical intervention should not be too hastily invoked.

J. W. RUSSELL.

The Diagnosis of True Neurasthenia from other Neurasthenic Conditions.

BORMANS (M.). *Archives Médicales Belges*, July, 1907.

TRUE neurasthenia must be distinguished from constitutional or hereditary neurasthenia and from certain organic diseases accompanied by neurasthenic symptoms. It depends on no

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constitutional or hereditary predisposition, but may be brought on by mental overwork, intoxications, auto-intoxications, infections, depressing moral conditions, traumatism and sometimes physical overstrain. The disorder is thus accidental and curable, and will only recur if the patient be again exposed to similar causal conditions. In the case of hereditary and constitutional neurasthenia, there is some hereditary taint, and the tendency to nervous and mental disturbance is evident from childhood. It may show improvement or actual remissions, but tends certainly towards relapse. In neurasthenia proper the mental faculties are depressed without being either perverted or destroyed; intellectual effort is painful, and the mind incapable of decision, but memory is unimpaired and the judgment sound. The mental depression of neurasthenia differs from that of melancholia in being based upon no insane or perverted ideas; the pains, fears and distress of the neurasthenic, though exaggerated, have for their basis an element of fact, and the patients can be reasoned with and reassurred. In neurasthenia of degeneration, on the other hand, the conceptions are not always reasonable, and are often insane. The patients are subject to true hypochondriacal ideas, obsessions, and impulses which may become irresistible. They are emotional and irritable, and cannot be convinced of their irrationality. True neurasthenia rarely developes in youth, but is the outcome of exhausting conditions met with in the struggle of later life. In constitutional neurasthenia, the condition is of old standing, and is only an exaggeration of the habitual mental attitude of the patient.

The diagnosis between constitutional neurasthenia and certain insane conditions presenting neurasthenic symptoms may often be a matter of considerable difficulty. But in melancholia and hypochondriasis, for example, the mental power is more profoundly affected; whilst in the hereditary neurasthenic the reasoning power is less seriously impaired. Moreover, the true melancholic facies is never apparent. Early general paralysis may, however, be quite indistinguishable from neurasthenia, though the subsequent march of events and the development of ocular and other physical signs ultimately render the diagnosis unmistakable. In true neurasthenia the knee-jerks are preserved or exaggerated, and are equal on the two sides; those of general paralysis are rather diminished, and tend to be unequal. Ankle clonus is never met with in neurasthenia, but may be present in the later stages of general paralysis. Tremor of the upper extremities may be observed in either of these conditions; but fibrillary tremor of the tongue, lips and face, and disturbance of speech, are seen only in the organic disease. In an early stage, however, the diagnosis must often be allowed to remain undecided.

J. W. Russell.

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The Relative Order of Innervation of certain muscles of the Arm.

MACKINTOSH (ASHLEY W.). *Rev. of Neurology and Psychiatry*, May, 1907, p. 364.

SHORT notes are given of a case of fracture of the spine at the level of the sixth cervical vertebra, in which autopsy showed an almost complete crush of the cord at the seventh cervical segment. The patient lived 355 days.

In view of the distribution of the motor paralysis in the arms, taken in conjunction with the situation of the cord lesion —as found microscopically as well as macroscopically—the following conclusions are thought to be warranted:—

1. The extensors of the wrist are represented in the cord at a level higher than the triceps, the former almost certainly at the sixth cervical segment, the latter below this segment.

2. The pronators are represented below the extensors of the wrist and above the triceps, probably at the sixth and seventh cervical segments.

3. The extensors of the wrist are represented at a higher level than the extensors of the fingers.

4. The extensors of the wrist are represented at a higher level than the flexors of the wrist.

These conclusions are compared with the results arrived at by certain writers as to the segmental or root supply of the arm muscles.

AUTHOR'S EXTRACT.

The Frequency of Tuberculosis in Sweden.

JOHANSSON (T. E.) *Bull. de la ligue Nationale Suédoise contre la tuberculose.* 1907.

THIS paper forms a part of the report of the Swedish Committee on tuberculosis. The death rate in 1905 from tuberculosis was 2·26 per thousand. The average duration of the cases was $3\frac{1}{3}$ years from the first manifestation. 8·7 per cent. of those attacked were under 15 years, 77·3 between 15 and 50 years, and 14 per cent. over 50 years. Curiously enough a new maximum has appeared in Stockholm between the ages of 50—55 years. The statistics collected show that married males and females are more liable to tuberculosis than the unmarried. The most marked frequency was observed in tobacco workers, potters, printers, book-binders, photographers, and hotel servants. There are a number of other matters dealt with from the statistical standpoint which make the publication worthy of reference for those interested in this aspect of work on tuberculosis.

WALKER HALL.

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Surgery.

REVIEW OF SOME RECENT CONTRIBUTIONS TO THE SURGERY OF CANCER, WITH SPECIAL REFERENCE TO CARCINOMA OF THE BREAST.

By P. R. Cooper, M.D., B.Sc. (Lond.), F.R.C.S. (Eng.).

The Results of Radical Operations for the cure of Carcinoma of the Breast.

Halsted (W. S.). *Annals of Surgery*, 1907. Vol. xlvi., p. 1.

According to this writer the chief factors which determine the result of a radical operation for breast cancer are—(1) the variety of cancer; (2) the time which has elapsed since its appearance; (3) the degree of outlying involvement; (4) the activity of the gland (lactation, age of patient, etc.); (5) the thoroughness of the operation.

The present paper is concerned with three main groups of cases:—

1. Cases in which, at the one occasion, the complete subclavian and neck operations were performed.

2. Cases in which at the first operation the complete pectoral or subclavian, and at the second the supraclavicular or neck part was performed.

3. Cases in which only the complete pectoral operation was done, the neck being unexplored.

Records of 232 cases, operated upon at the Johns Hopkins Hospital three or more years prior to the last news received of them, are carefully tabulated.

Four of the 232 cases died in hospital—a mortality of 1·7 per cent., three of the deaths being in group 1, and one in group 3. In 18 cases the ultimate result could not be traced. Of the 214 traced cases the following may be accepted as cures, viz.:

35 cases living in 1906–7 = 16·6%.
20 cases living in 1905 = 9·5%.
16 cases known to have died of causes other than carcinoma of the breast three or more years after operation = 7·9%.
4 cases known to have died of other disease less than three years after operation in which cure was demonstrated by autopsy = 1·9%.

In 14 cases metastasis appeared after three years, in one instance as late as 8 years, and in two more than 6 years after operation.

The *pathological diagnosis* in relation to the ultimate result is given as follows:—

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Variety of Cancer.	Number of Cases.	Cures.	Per cent.
Cancer cysts	6 ...	2 ...	33·3
Adeno-carcinoma	32 ...	24 ...	75·0
Medullary carcinoma	25 ...	12 ...	48·0
Circumscribed scirrhus ...	28 ...	13 ...	46·4
Small infiltrating scirrhus	80 ...	30 ...	35·5
Large infiltrating scirrhus	39 ...	8 ...	20·5
Total	210 ...	89	

The degree of *glandular involvement* in relation to the final results was as follows:—

	Cases	Cured	Per cent.	Cured 3 years	Per cent.
Axilla and neck positive	60	45	75·0	51	85
Axilla positive, neck negative	110	27	24·5	34	31
Axilla and neck positive	40	3	7·5	4	10

The writer is in full accord with Handley's views as to the mode of spread of cancer of the breast, including the distribution of the "cancer area;" hence in operating he insists upon the importance of removing not only a large area of skin and a still larger area of subcutaneous tissue, but also the deep fascia covering the upper part of the rectus, serratus magnus, subscapularis and parts of latissimus dorsi and teres major muscles. Both pectoral muscles are of course removed. In some cases, he considers even part of the chest wall may have to be excised, and in case of involvement of the humerus even amputation at the shoulder joint may be required. In planning incisions no attempt should be made to retain a skin covering for the wound, as Thiersch grafts will serve their purpose.

The writer further thinks that in incomplete operations or diagnostic incisions the Paquelin cautery should be used in preference to the knife so as to avoid disseminating the disease.

End Results of 376 Primary Operations for Carcinoma of the Breast at the Massachusetts General Hospital, between January 1, 1894, and January 1, 1904.

GREENHOUGH (R. B.)., SIMMONS (C. C.)., and BARNEY (J. D.). *Annals of Surgery*, 1907. Vol. xlvi., p. 20.

OUT of 416 cases of primary operation for cancer of the breast 376 were traced by these writers to a conclusive end result, at an average period of eight years after operation. Of these 376 traced cases 64 were alive and well, and 7 died without recurrence over three years after the operation. The percentage of "radical cures" was 20·9.

During the same period palliative operations only were

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performed on 56 patients (15 per cent.), and 52 cases were discharged untreated.

Cases in which the tumour was ulcerated, or was adherent to the skin or chest wall, and cases in which the axillary glands were palpably enlarged, gave notably less promising results than when these conditions did not exist.

No case with palpably enlarged cancerous glands above the clavicle, and no case of cancer of both breasts was cured.

Medullary carcinoma was more grave than scirrhus, and adenocarcinoma and colloid were relatively far less malignant in type.

The duration of the disease, other than in the individual case, exerted little influence on prognosis.

Extensive operations with wide removal of skin gave the greatest freedom from local recurrence.

Removal of the pectoralis minor appeared to be of slight significance. Incomplete operations on early cases yielded better results than extensive operations on well advanced cases.

Recurrence in the scar occurred in less than half the cases.

Internal metastases were most frequent in the lungs, mediastinum, axillary and supra-clavicular glands, liver and spine. 17 out of 88 cases, or 19 per cent., of those passing the three year limit without evidence of recurrence, shewed recurrence later, and 4 cases developed recurrence six or more years after operation.

Final Results in 164 cases of Carcinoma of the Breast operated upon during the past fourteen years at the Augustana Hospital.

OCHSNER (A. J.). *Annals of Surgery,* 1907. Vol. xlvi., p. 28.

AN analytical table is given for the whole 164 cases stating for each the patient's age, degree of involvement, date and nature of operation, and the result, with the date of the last communication from the patient.

Communication with the patients or their physicians was established in 98 cases, and of these 54 are still living, and with two exceptions, are free from recurrence.

The time which has elapsed since operation is 1 year in 9 cases, 2 years in 11 cases, 3 years in 5 cases, 4 years in 7 cases, 5 years in 4 cases, 6 years in 5 cases, 7 years in 4 cases, 8 years in 1 case, 9 years in 3 cases, 10 years in 1 case, 11 years in 2 cases, 12 years in 0 case, 13 years in 2 cases.

The deaths were as follows:—from shock 5 cases, within 1 year 19 cases, within 2 years 6 cases, within 3 years 6 cases, within 4 years 1 case, within 5 years 2 cases, within 6 years 1 case, within 7 years 1 case, within 8 years, 9 years and 10 years 0 cases, within 11 years 1 case, within 12 and 13 years 0 cases, within 14 years 1 case. In 5 cases, however, death was due to other causes than carcinoma.

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All patients operated upon during the past 6 years had X-ray exposures during their stay in hospital, and in some instances recurrences have disappeared under this treatment.

The writer concludes that if the complete operation as now practised is employed reasonably early there is good reason to expect a fair percentage of permanent cures.

End Results following Operations for Carcinoma of the Breast.

JACOBSEN (N.). *Annals of Surgery*, 1907. Vol. xlvi., p. 43.

OF 71 cases traced by this writer 35 are still living, 33 died of metastases and 3 died, within a year of operation, from other diseases.

In the writer's experience some of the most acute recurrences were instances of scirrhus. In 3 cases a malignant tumour of the male breast was met with, each of them recurred and ended fatally. In 2 cases the patients' ages were 80 and 78 respectively. Both stood the operation well and died from other causes than carcinoma.

For the past 2 years, whenever possible, the patients have been given weekly X-ray treatment for at least 3 months after their recovery from the operation.

The writer is of opinion that the 3 year limit usually put upon these cases is altogether too short.

The End Results following Operations for Carcinoma of the Breast.

OLIVER (J. C.). *Annals of Surgery*, 1907. Vol. xlvi., p. 51.

THIS writer gives a synoptical table of 35 cases operated upon up to April 1st, 1907, all of which have passed the three years limit or have died before the expiration of that period.

Of the 35 cases, 22, *i.e.*, 62·8 per cent., are dead from recurrence, whilst 12, *i.e.*, 34·2 per cent., are alive and well from 3 to 10½ years after operation. One is alive after more than 3 years, but she is at present the subject of an inoperable recurrence.

The average duration of life after operation (in fatal cases) was 20 months, the extremes being 5 years and 5 months.

The average time of recurrence was 14¼ months, the extremes being 56 and 3 months.

Twenty-eight of the patients were married, 7 were spinsters; 10 of the married and 2 of the single women recovered.

Central growths and those situated in the lower third of the breast gave a much larger percentage of recoveries than growths located elsewhere.

It is only fair to add that 14 out of the 35 cases were beyond the possibility of cure by operation, and were only operated upon in the hope of prolonging life or to remove offensive ulcerated breasts. If these 14 cases be subtracted we get 21 cases with 12 recoveries, *i.e.*, about 57·6 per cent.

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The radical operation, *i.e.*, with removal of both pectoral muscles, but without clearing out the supra-clavicular region, was done in 30 cases with 10 recoveries, *i.e.*, 33·3 per cent.

In conclusion, the writer considers the present operative treatment of cancer of the breast as far from ideal, the hope of the future lying rather in better prophylaxis and a better knowledge of the nature of the disease.

Carcinoma of the Breast.

CABOT (A. T.). *Annals of Surgery,* 1907. Vol. xlvi., p. 57.

THIS is a study of the pathological conditions and their relation to the question of recurrence.

Forty-two cases were studied. All recovered from the operation, and of these 9 remain free from recurrence at periods varying from 4 to 19 years.

Twenty-eight cases have died of the disease, of these 17 died in 1 year, 2 in 2 years, 1 in 3 years, 2 in 4 years, and 6 in 5 years.

In 19 cases the complete operation was performed, *i.e.*, with removal of both pectorals, in 2 there has been no recurrence, in 5 the patient is living with recurrence, in 12 the patient has died.

The *nature of the growth* and the degree of involvement of the lymphatic system was found to have a far greater influence upon the question of recurrence than the thoroughness of the operation. If the disease had affected many lymphatic glands it was sure to recur even when all the muscles and axillary contents were removed, on the other hand, in the 9 cases that did not recur the lymphatic involvement was slight in all while in 7 out of 9 the muscles were not removed.

The writer insists strongly upon the danger of recurrence from inoculation of the wound with cancer cells set free during operation, to avoid this he advises removing breast, muscles, and axillary contents in one mass, irrigating the wound, and applying tincture of iodine to the surface of the wound. He is also favourable to the X-ray treatment of the part immediately after operation so as to destroy any particles of cancer that may have escaped removal. For this exposures are made twice weekly for three or four months after operation. This treatment is, however, too recent to permit of a final judgment.

End Results following Operations for Carcinoma of the Breast.

PILCHER (L. S.). *Annals of Surgery,* 1907. Vol. xlvi., p. 67.

THIS writer refers especially to results obtained in cases in which the lymph glands above the clavicle were infected and the supra-clavicular spaces were cleared out in addition to the typical operation upon the thorax and axilla. Of 10 such cases reported in 1900, 3 have remained free from recurrence.

During the six years 1901–6, out of 34 additional operations

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for breast carcinoma, in 18 it was deemed advisable to clear out the supraclavicular space. In 4 of these cases palpable glands were present; of these 1 died three months later without local recurrence, but probably from internal carcinosis, the operation evidently having been an incomplete one. The second case had one year later developed multiple recurrent nodules in the thoracic region; these were kept under control by X-ray treatment for two years; later a growth developed in the opposite breast, which was removed by the " complete " operation. She finally died from intrathoracic metastasis five years after primary operation. The third case developed a suspicious nodule on the thorax within the first year; this disappeared under X-rays, and she remained in good health for two years, and is then reported to have died of pneumonia (?) The fourth case remains well two years after operation.

Out of 14 cases in which no palpable nodules were found in the neck even at the operation, section revealed cancerous invasion in 11 cases. Of the 3 cases in which no such invasion could be traced all have remained well to date, *i.e.*, 5, 1½ and 1 year respectively. Of the 11 cases in which invasion of the supraclavicular glands were detected on section, all have been followed but 1. One died from myocarditis seven weeks after operation; 3 developed speedily both regional and distant metastases and died within one year; 1 was was re-operated upon at the end of one year for a recurrent nodule in the lateral thoracic region, and died from hepatic cancer two years later; 1 remained well for four years, but has recently developed recurrence. Four cases still remain free from recurrence, 2 three years and 1 two years, and 1 one year respectively since operation.

The writer concludes, therefore, that in a considerable proportion of cases of carcinoma of the breast the supraclavicular glands become early infected; hence in all cases of any duration or extent incision into the base of the neck and systematic removal of all possibly infected tissue should be incorporated with the complete removal of the breast and axillary glands and lymphatics.

Very late Recurrences after Operation for Carcinoma of the Breast.

RANSOHOFF (J.). *Annals of Surgery*, 1907. Vol. xlvi., p. 72.

THIS writer has collected records of 37 cases in which cancer recurred seven years of more after the primary operation for carcinoma of the breast. Of these 26 were clearly local recurrences and 11 were doubtful. Amongst the local recurrences are included cases in which the regional lymphatics of the axilla, neck or thorax were involved. Perhaps also some of the abdominal recurrences were due to retro-infection of the lymphatics.

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In 3 cases there was cancer in the other breast, but it is doubtful whether these were to be regarded as recurrences. Similarly, cases of cancer of the rectum, stomach and uterus were more likely to be fresh developments than true recurrences. On the other hand later metastases without local recurrence, *e.g.*, in the brain (10 years), spine (10 years), liver (13 years), were probably true metastatic recurrences. Of clear local recurrences 10 occurred during the 7th and 8th years after operation, 2 each from the 9th, 10th, 11th, 12th and 15th years, and 1 each from 15th to 25th years. Even in these late recurrences the tumour growth was in the scar or its immediate vicinity and there was usually no axillary involvement. The writer is inclined to believe that some of these cases were not true recurrences but instances of fresh cancer development upon the scar, —scars being a favourite site for such development.

Carcinoma of the Bones following Carcinoma of the Breast.

WHARTON (H. R.). *Annals of Surgery*, 1907. Vol. xlvi., p. 81.

THIS writer reports the following 5 cases of secondary carcinoma of the bones following cancer of the breast:—

CASE I. *Cancer of lumbar vertebra.* Symptoms first occurred 3 months after excision of breast for carcinoma, and consisted chiefly of pain and tenderness in the lumbar region and sacral plexus, difficulty in walking, etc., there was, however, no paralysis. Death occurred about six months later from angina pectoris, and at autopsy the diagnosis of carcinoma of the lumbar vertebra with chronic spinal pachymeningitis was confirmed.

CASE II. *Cancer of left clavicle.* Developed 5 months after removal of left breast. Pain in the clavicle was complained of and spontaneous fracture occurred on turning in bed. A marked tumour developed at seat of fracture before death, which took place two months subsequently.

CASE III. *Cancer of both femora.* Six months after removal of breast pain was felt in both femora. One morning whilst sitting in a chair both femora fractured, apparently by muscular action. Prior to death, which occurred two months later, tumours developed over the right humerus and left parietal bones.

CASE IV. *Carcinoma of right femur.* Eight months after removal of breast, fracture of right femur occurred while turning in bed. A large spindle-shaped tumour developed at seat of fracture. Death occurred several months later.

CASE V. *Carcinoma of left femur.* In this case spontaneous fracture of the femur was the first indication, although the patient admitted suffering from pain in the left femur and a painful tumour of the left breast for several months previously. A firm tumour was found in the breast. The patient died some months later from pulmonary metastasis.

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Thymus Gland Treatment of Cancer.

GWYER (F.). *Annals of Surgery,* 1907. Vol. xlvi., p. 86.

THIS is a preliminary report upon the employment of fresh thymus gland, either in the form of a watery extract or dried and ground into powder, in the treatment of inoperable cancer.

In one case repeated operations for cancer of the breast and X-ray treatment had failed to arrest the disease. When thymus treatment was commenced there was pain in the breast, arm and shoulder, so great as to prevent sleep at night. There was a mass of cancerous glands beneath and above both clavicles and in the right axilla, and there were several glands higher up the neck. The arm and shoulder were very swollen. Within 48 hours of first taking thymus substance pain diminished, and the patient was able to sleep. The swelling of glands and of the arm and shoulder began to subside. The temperature rose to 102° and even 104°F., but the pulse was never above 90 and of good character. Fever lasted nine days. The patient was kept in bed, and quinine and later salol administered. Although pain was sometimes intense the diminution in size of the glands continued. She has since remained free from pain, and has regained strength and appetite; the swelling of the arm and shoulder has gone; and of the different masses of glands only two slightly enlarged ones above the right and left clavicles remain. Treatment has been remitted to allow the patient time to recover from the reaction, but the improvement so far is so marked that the writer hopes cure will ultimately be effected. In another case in which cancer had developed upon X-ray burns of the hands, and repeated removal had failed, a year's treatment with thymus gland has prevented further recurrence, and the skin has returned to its normal appearance.

Inoperable cases of cancer of the penis with recurrence in the groin, cancer of larynx with recurrence in the glands of the neck, cancer of the rectum and two more cases of carcinoma of the breast with supraclavicular recurrence are mentioned in which improvement has resulted from the treatment.

On the Distribution of the Arteries in the upper part of the Mesentery.

KONTOWT (M.). *Méd. Journ. de la Suisse Romande,* 1907.

WITH the increase of operations upon the upper part of the jejunum the necessity for some means of readily recognising that portion of the gut has increased, and a more minute knowledge of its vascular supply has become desirable. Mlle. Kontowt's observations show that the arrangement of the intestinal branches of the superior mesenteric artery distributed to the upper part of the jejunum is characteristic. As a rule they form only one series of arcades of great regularity and of

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considerable size, and the convexities of the arcades constitute collectively a longitudinal vessel running parallel with, but at some distance from, the gut wall. This vessel had been previously seen by Dwight, who named it the " parallel vessel," and Mlle. Kontowt accepts this designation as well chosen. From the parallel vessel spring the vasa recta, which are longer, more regular and separated from each other by more uniform spaces in the region of the jejunum than at lower levels. On account of this arrangement of the vessels a considerable portion of the gut may be separated from its mesentery without danger of gangrene. It must be remembered, however, that variations sometimes occur, and the vascular supply of the jejunum may become similar to that of lower parts of the small intestine, thus diminishing the chances of successful operations. Such modifications fortunately do not appear to be very frequent, and Mlle. Kontowt calculates that normal arrangement which is favourable for œsophago-jejuno-gastrostomy is present in 94·6 per cent. of all cases.

ARTHUR ROBINSON.

Temporary Gastrostomy in certain acute Gastric and Duodenal Disorders.

LENNANDER (K. G.). *Hygiea,* Stockholm, 1907, p. 753.

THE author describes how he has already recommended a temporary gastrostomy in the treatment of acute dilatation of the stomach, and also in cases of peritonitis in which paralysis or paresis of the jejunum is present. He also uses gastrostomy in treating perforating stenosing gastric or duodenal ulcers, if the patients are not in a state to stand the longer operation of a gastro-jejunostomy, performing gastro-jejunostomy at a later date if it seems advisable. He describes the case of a female patient with perforated pyloric ulcer, left subphrenic abscess, free fibrino-purulent peritonitis on the right side, and operated upon sixty hours after perforation. In this case he performed a pyloric gastrostomy and a cæcal colostomy, also closing the perforated ulcer in the pylorus. Convalescence was protracted (two months); the intestinal paresis ceased ten days after the operation. The cæcal fistula was closed in five weeks, the gastric after $3\frac{1}{2}$ weeks time. Three months after the operation anterior gastro-enterostomy and entero-anastomosis were performed, symptoms of obstruction having returned; six months later the patient was in good health. Prof. Lennander discusses this and other cases, and recommends a temporary gastrostomy whenever it is desired to give the stomach rest, or to apply local treatment to it very thoroughly, *e.g.*, in acute gastrectasis; or in cases of paralysis or paresis of the jejunum; or when a perforated gastric ulcer concurs with pyloric or duodenal stenosis

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and opportunity for gastro-jejunostomy is lacking; or when it is uncertain that a perforated gastric ulcer has been satisfactorily closed at the operation; or when the perforated ulcer has caused a degree of peritonitis likely to set up intestinal paresis.

A. J. JEX-BLAKE.

Excision of the Hip Joint and the after-treatment thereof.

BEESLY (L.). *Scottish Med. and Surg. Journal,* August, 1907.

THE poor results often obtained after excision of the hip are due in part to a mistaken appreciation of the mechanics involved and to surgeons aiming at mobility rather than stability. Any operation involving removal of the head and neck of the femur destroys the mechanical advantage obtained by the normal angle (varying between 160° and 110°) at which the neck is set. Unless this mechanical provision is restored after operation deformity and shortening are bound to result and to progress. To achieve this the femur after operation should be abducted along a line corresponding to the original direction of the neck.

The consequent lowering of the pelvis assists the security of the implantation, and adduction of the sound limb occurring at the same time helps to bring the two limbs into parallelism. The maintenance of abduction should also be furthered by preliminary myotomy of the adductors.

The operation and after-treatment as practised by Stiles are described in detail. The adductors are first openly divided, and the excision then proceeded with using Kocher's posterior angular incision. After removal of the head and neck, and of the trochanter if diseased, the end of the bone is trimmed and jammed into the acetabulum, an extra-assistant keeping up abduction till the abduction splint is applied. The greatest care is required in dressing to prevent slipping of the femur. After 20 days a plaster case is applied to the pelvis and operated limb only, with crutches and a patten to the sound foot. The whole treatment should occupy at least a year.

G. R. MILL.

Four cases of Acute Empyema of the Mastoid Cells, in three of which the cavity made by the operation was treated by the Iodoform-Wax Bone-plugging method of Mosetig-Mornhof

STODDART-BARR (J.). *Glasgow Med. Journal,* September, 1907.

THE usual post-operative treatment of such cases consists in packing the cavity with antiseptic gauze until it is filled up by healthy granulation tissue. This generally takes 8 to 10 weeks and may result in an unsightly depressed scar.

The bone-plugging method considerably shortens the after treatment and gives rise to no depressed cicatrix.

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The iodoform wax of Mornhof consist of powdered iodoform 60 parts, oil of sesame 40 parts, spermaceti 40 parts, the mixture melting at 112°F.

The technique is as follows:—three days after the operation the packing is removed and the cavity carefully cleansed and again lightly packed; this is repeated daily until the eighth day when the iodoform wax, melted and sterilised in boiling water and allowed to cool to slightly over 112°F., is run into the cavity where it almost immediately solidifies. The sutures which were introduced at the operation are now tied.

It is important to avoid pouring in too much of the wax as would produce tension when the soft parts are brought together. All bleeding from granulations should be stopped by careful mopping. In the three cases healing was complete in sixteen, eighteen and twenty-one days respectively; in the fourth treated by the ordinary method the process occupied twelve weeks, leaving a large depressed cicatrix.

LINDLEY SEWELL.

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Pathology.

The Amyotrophy of Chronic Lead Poisoning: Amyotrophic Lateral Sclerosis of Toxic Origin.

WILSON (S. A. K.). *Review of Neurology and Psychiatry*, June, 1907, p. 441.

IT is agreed that the muscular atrophy of lead poisoning is in part at least attributable to the action of the toxic agent on the motor cells of the cord. Whether the effect of that action is limited to the lower neurones is not so certain. According to various authorities no distinct sclerosis of the pyramidal tracts has been observed, even in cases of long duration. In the present communication four cases of undoubted lead palsy are analysed in detail, in which, notwithstanding treatment, the amyotrophy has steadily progressed; in which, further, there have appeared at a later stage signs pointing unmistakably to a sclerosis of the pyramidal tracts, so that the condition is finally indistinguishable from what is known clinically as amyotrophic lateral sclerosis. In each of these four cases the onset was characteristic of an ordinary lead palsy, viz., double drop wrist. It was followed by a progressive amyotrophy of irregular distribution associated with cramps in the limbs, fibrillation, involuntary spasmodic movements, etc., and in two cases evidence was forthcoming of the spread of the disease to the medulla, and these at least warranted the diagnosis of amyotrophic lateral sclerosis which was made when the patients entered hospital. These clinical documents justify the argument that one of the actions of lead is not merely to cause a lower motor " neuronitis " (Grasset), but also to effect a change in the upper neuron, resulting in a varying degree of spasticity, with exaggeration of deep reflexes and extensor responses. An interesting analogy is thus suggested from the known action of other toxic agents on the nervous system. Ergotism, lathyrism, and pellagra are diseases where systematised degeneration of various spinal and other tracts follows the introduction of a toxic substance into the organism; syphilis itself is a toxic agent which leads to a form of spinal sclerosis.

AUTHOR'S ABSTRACT.

Upon the Structure and Function of the Choroid Plexuses.

FRANCINI (M.). *Lo Sperimentale*. Anno lxi., Fas. iv.

BY means of experiments, accompanied and followed by careful microscopical examination, Dr. Francini has convinced himself that the evidence afforded by frogs, guinea pigs, rabbits, and dogs shows definitely that the epithelial cells of the choroid

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plexuses play an active functional part in the secretion of the cerebro-spinal fluid. By the use of staining methods adapted for the purpose he has been able to demonstrate that secretions are produced in the cells by the nuclei from which they pass through the cell protoplasm into the cerebro-spinal fluid. Dr. Francini has shown also that the secretive activity is demonstrable during the period of intra-uterine life and that it undergoes a temporary augmentation at birth. He has also been able to prove that the secretory function of the cells of the choroid plexuses are modified by drugs which modify the secretory powers of other gland cells and he is convinced that the choroidal epithelium plays an active part in the production of acute inflammatory hydrocephalus. ARTHUR ROBINSON.

The Liver of the Dog after Complete Removal of the Thyroid and Parathyroids.

DELITALA (F.). *Lo Sperimentale.* Anno lxi., Fas. iv.

As a result of his examination of the livers of a series of dogs which had previously undergone complete removal of the thyroid and parathyroids Dr. Delitata has been led to the conclusion that the hepatic lesions following such experiments are varied and that there is no constant association between them and the symptoms observable as the result of thyro-parathyroidectomy. This conclusion is in harmony with the chemical observations of previous observers which have tended to show an intimate association between the thyroid and parathyroids and the kidneys but none between the former organs and the liver.

ARTHUR ROBINSON.

In the Hæmopoetic Organs during Digestion.

PIRONE (E.). *Lo Sperimentale.* Anno lxi., Fas. iv.

As the result of experiment on young, adult, and old dogs Dr. Pirone concludes that when digestion is proceeding both the spleen and lymphatic glands become engorged with blood and enter into a phase of augmented activity of a nutritive, formative and functional character, during which increased production of plasmocellular megakaryocytes and phagocytes takes place and the process of hæmolysis is increased. He was not, however, able to verify the occurrence of the great increase of myeloid cells which has been stated by some observers to be so great in the spleen during digestion. ARTHUR ROBINSON.

Baccillus Pyrogenes associated with a Febrile Disease.

HEISHBERG (L. K.). *American Journ. of the Medical Sciences,* January, 1907.

HEISHBERG describes a case of acute febrile disease in which a new bacillus was isolated from the blood.

A male patient, æt 36, with temperature lasting eight weeks

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but never above 102°, exhibited meningeal symptoms, photophobia, tremors, irritability, subsultus tendinum, and joint involvement, the Widal reaction was absent and there was a leucocytosis of 14,000.

Cultures from the blood revealed a lemon yellow diplobacillus, pathogenic for rabbits and guinea pigs. Gram negative, actively motile, not liquefying gelatin till the 7th day and producing no gas in lactose, saccharose or glucose media.

Milk mannite and litmus agar were acidified. The organism was killed by an exposure to 60°C. for 10 minutes. It has been named bacillus pyrogenes.

J. R. CARVER.

The Bacteriology of the Blood in Typhoid Fever.

COLEMAN (W.) and BUXTON (B. H.). *American Journ. of the Medical Sciences*, 1907.

COLEMAN and Buxton have collected statistics of 1,602 examinations of the blood in typhoid fever, in which the bacillus was found in 1,197, or 75 per cent. Their own numbers are 125 cases, with 81 positive results; but when using the ox-bile medium of Conradi they have found the bacillus in nearly every case. The medium is prepared as follows:—Take ox-bile 90 c.c., glycerine 10 c.c., and peptone 2 grams. Of this put 20 c.c. into flasks; sterilise, and add 3 c.c. of blood to each flask, incubate for one day, and from them inoculate litmus-lactose agar plates. In the first week 89 per cent. were positive, the earliest recorded being on the second day; in the second week 73 per cent. were positive; third week 60 per cent.; fourth week 38 per cent.; after the fourth week 26 per cent. They conclude that the typhoid bacillus is present in the blood in every case of typhoid fever, and that failure to recover it is due to error in technique. Most investigators agree that the bacillus disappears from the blood with the defervescence.

The authors argue that as the bacilli may live and multiply in the intestines of healthy persons and may be found in the bile and in abscesses without producing the symptoms of typhoid fever, therefore the symptoms of typhoid fever are due to there being an invasion of the blood or a bacillæmia with destruction of the bacilli and liberation of the endo-toxin. It is doubtful if the bacilli multiply in the blood or whether their presence represents an overflow from the lymph organs. In relapses the bacilli are again found in the blood in 90 per cent., and this re-invasion of the blood with destruction of the bacilli causes the symptoms of the relapse. The bacilli are found in the blood before the serum reaction developes; this is necessarily so because the endo-toxins must be liberated before the agglutinins can be formed.

J. R. CARVER.

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Muco-Membranous Colitis: a study of some points in its Pathogenesis and Treatment.

KING (D. BARTY). *Scottish Medical and Surgical Journal,* September and October, 1907.

THE author regards mucous and membranous colitis as two phases of one disease; mucous colitis is the earlier one, which may often develope into the membranous form. On the other hand, however, both may remain distinct and separate. Any advance which is being made respecting this disease is in dietetics; no fresh light has been shed on the pathology, owing to the absence of autopsies. Constipation as a feature of the disease occasionally alternates with a spurious diarrhœa, and it must be borne in mind that a genuine diarrhœa sometimes preceeds the condition. The common paleness of the fæces has been ascribed to the excess of fat in the diet, but at most, this can only be true in some cases. The fæces are always alkaline, and often foul. Intestinal sand is not constant, as used to be said, but is only occasionally found. The onset of mucous colitis is favoured by drastic purging and low dieting. Langenhagen only found a neurasthenic or hysterical state to preceed the condition in 16 cases out of 304, but it more often follows; in this regard the association of the neurotic element with abdominal disease in general deserves to be noted. There is no direct relation with appendicitis. Worry and menstruation aggravate the condition, while exercise and pleasurable sensations relieve. It has been argued that the mucous discharge, being free from fibrin, cannot be inflammatory. Hæmorrhage is more frequent than is usually stated, and may occur independent of the stools. Pain is due to spasmodic contractions of the atonic large intestine. Mucous colitis is primarily a local condition set up by stationary or passive fæcal irritation, which gives rise to a low traumatic inflammation and its effects. The neurotic constitution may be latent, but is important, and so is the congenital intestinal factor. Chronic constipation and hysteria or neurasthenia may coexist occasionally without muco-membranous colitis. As regards treatment the author divides his cases into two classes: the ordinary case, and the severe case, with marked emaciation and neurotic symptoms, as well as frequent bloody discharge. Both classes are better treated away from home. In the severe case the patient and his friends should be told at the outset that success is not certain, and if it follows it may take anything from six months to two years to achieve. In both cases at the start a hot water enema is given followed by a large olive oil enema, which is retained all night by the aid of a morphia suppository if necessary. The next day the hot water enema is given, and the day following the oil one. It may be necessary to continue this treatment for about a week, but, if possible, it should not go on for longer. For the first

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three days in the mild cases, and for a month or six weeks in the severe, the patient is kept in bed. After the fourth day the milk diet is replaced by gradually adding large residue foods and such fats as will satisfy the nutritive requirements of the case, so as to gradually bring about a daily movement of the bowels; from this time also massage and faradism and simple exercises are prescribed, with regular exercise. The whole day should be fully occupied. Castor oil is given three hours before breakfast daily. After four to six weeks under immediate observation the mild cases may be sent to the sea with a capable nurse, and the treatment continued until the patient can do without purgatives, and, if possible, with an ordinary diet. If a slight relapse occurs adopt the initial dietary without purgatives, and if this is insufficient yeast in keratin-coated capsules, strychnine and belladonna are all of service, as in the severe type of case after they are getting about. In the severe cases pancreatic emulsion or pancreatin may be given an hour before lunch and dinner. If castor oil is not well borne, the method of administration should be varied before it is given up, as it is difficult to find an efficient substitute; if a substitute is absolutely necessary probably cascara succeeds next best, given at night. Cod liver oil is a most efficient substitute for more expensive fats where there is emaciation present. Operative measures should not be considered until all these methods above mentioned have proved futile. Before discharging any case impress upon him the four following rules, and endeavour to ascertain the best means of getting them carried out:—(1) endeavour to obtain a satisfactory morning evacuation, even if the desire for defæcation be not present, (2) eat a sufficient quantity of the specified food, irrespective of the appetite, (3) take regular daily exercise, and also a few simple exercises just before the morning cold bath, (4) see that the whole day is fully occupied.

FRANK E. TYLECOTE.

Observations on Cadaveric Changes in the Pancreas.

LEONOINI (F.). *Lo Sperimentale*, Anno lxi., Fasc. v.

OBSERVATIONS made on rabbits and dogs and a series of young and old human subjects have led Dr. Leonoini to the following conclusions:—The pancreas is one of the parenchymatous organs in which cadaveric changes most rapidly commence and proceed, sometimes even more rapidly than in the delicate suprarenal bodies. The changes are so rapid that complete necrosis may occur within a few hours after death. The commencement and progress of the cadaveric changes varies from case to case, and there seems to be no constant relation between the progress of the changes, the surrounding temperature,

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the age of the individual and the cause of death. Occasionally the progress of the changes varies from point to point of the organ, foci of necrosis being intermingled with comparatively normal tissue. Therefore it is not possible to fix the period which has elapsed since death by the condition of the pancreas. The changes commence in the epithelium and extend to the surrounding connective tissue, and bacteria are always demonstrable in the foci of alteration, but they are not the only cause of the degenerative changes, auto-digestion and autolysis also playing a part.

ARTHUR ROBINSON.

A Statistical Study on the Polymastia of the Japanese.

IWAI (T.). *Lancet,* September 14 and 21, 1907.

DR. IWAI'S extensive study of polymastia in Japanese brings out the following facts:—So far as the recorded cases show, out of a total of 581 supernumerary glands in males, the accessory glands were at a higher level than the normal gland in 349 cases, and below it in 232 cases; whilst of 1,680 supernumerary glands in females 1,050 were above the normal breasts and 49 below. These results differ from those obtained by European observers from European subjects, with regard to whom statistics seem to prove that the more common position of accessory glands is below that of the normal glands. Amongst the Japanese Dr. Iwai has not been able to find accessory glands in such unusual situations as the back and shoulder where they have been described as met with in some Europeans. Dr. Iwai's results, like those of previous observers, seem to suggest that there is hereditary transmission in about 6 per cent. of the subjects, and in such cases the transmission is usually from the mother, and his investigations have led him to believe that there is an association also between multiparous births and polymastia. He thinks it is probable women with supernumerary mammary glands have a tendency to become pregnant more frequently than is usually the case in ordinary women. He finds that additional glands are more commonly present among the lower than among the higher classes, and that they are especially common amongst people of low intelligence.

ARTHUR ROBINSON.

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Therapeutics.

Treatment of Ankylostomasis.

CODINA (J.). *Revue de Méd.*, 1907. Vol. xxvii., pp. 778 & 821.

THIS research was carried out on Spanish miners, and the following deductions are drawn :—

1. Preliminary preparation is absolutely essential. No food should be given after 5 p.m., and a saline purgative should be given at 9 p.m. This evacuates the mucus and the ova. The anthelmintic is given the next morning.

2. Methods of treatment: (1) Male fern, though not dangerous, is ineffective. (2) The following mixture is fairly satisfactory :—

Eucalyptol	2 grams.
Chloroform	3 grams.
Castor oil	40 grams.

This is divided to three doses and taken at intervals of half an hour from 6 a.m. The treatment is carried out once a week till the evacuations contain no parasites and no ova. This eucalyptol mixture gives little pain, but causes marked lethargy. It is effective, but not so rapidly as the next drug. (3) The most satisfactory preparation is β-naphthol. Of this 2 grams are given in cachets of ½ gram apiece, two of which are given at 6 a.m. and two at 7 a.m. of the day following the preliminary preparation. Only a little water is allowed between 7 and 9 a.m., at which time the following purgative is given

Infusion of senna leaves	300 grams.
Sodium sulphate.....	30 grams.
Syrup of rhubarb	30 grams.

The β-naphthol, which has the advantage of certainty and rapidity, as well as of being easily given, is given one day in each week till by the absence of ova it is determined that no parasites are left. The treatment may be made more rapid by giving the drugs every fourth day.

3. Number of worms expelled and the time taken for cure. A noticeable fact is that the number of doses necessary is not proportional to the number of worms present. Usually three or four days' treatment is necessary; these at intervals of a week with an allowance of some days for search for ova necessitates a stay in hospital of over a month. The greatest number of days in which treatment was necessary was eleven. Usually, though not always the greatest number of worms was passed on the first day. In eight cases under 100 worms were obtained, in eight there were between 100 and 200, in fifteen between 200 and

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300, and in ten cases over 300. In one of these over 1,000 worms were found.

4. After treatment the subjective symptoms are allayed rapidly, the objective symptoms not so quickly. The pallor persists for a long time in those who have been freed from the worms but who have had no subsequent tonic treatment.

5. The red corpuscles which average before treatment about 3,000,000, are increased when the worms have been voided. Hæmoglobin increases in a fairly similar proportion. The leucocytes, which in this disease may be slightly increased or diminished, tend to become normal in number. The eosinophiles, which vary from 2 to 60 per cent., are sometimes increased and sometimes diminished with treatment. There is no certain fall in numbers immediately after cure.

6. In the urine, the specific gravity, urea, uric acid and phosphoric acid all tend to reach the normal level when the patient is cured. In a few cases a definite albuminuria with casts occurs with ankylostomiasis. This disappears entirely with the departure of the worms.

E. B. LEECH.

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Reviews.

"Diseases of the Male Generative Organs." EDRED M. CORNER, M.C., F.R.C.S. The Oxford Medical Publications. Price 5s.

THE impression left by a careful reading of this book is one of "unevenness." Many of the chapters are simply and graphically written, and contain matter of great practical value, others are marked by scant accounts and scarcely contain anything more than is to be found in the pages of a good text-book; others, again, are speculative in nature and of interest rather to the operating surgeon than to the student or general practitioner.

The first chapter on Hydroceles is excellent, and rightly insists on the fact that these conditions are symptoms rather than diseases.

The chapter on the Imperfectly Descended Testicle is interesting from a speculative rather than practical point of view. We note with pleasure the strict limitations placed by the author on orchidopexy and the recommendation that replacement in the abdomen is the best line of treatment "in far the majority of cases." The account of Torsion is good, but altogether disproportionate in length and detail to the accounts of many more common conditions. The description of Tuberculosis Syphilis and New Growth is excellently done, whilst the section on Varicocele is rendered of great practical value by the incorporation of the author's researches into the immediate and ultimate results of operative treatment.

The majority of the chapters are marked by clear writing and sound commonsense. This is nowhere more apparent than the chapter on the Functional Affections, a subject on which much nonsense has been written. This chapter we would confidently recommend to the notice of our readers.

"Diseases of the Ear." By HUNTER TOD, M.B., F.R.C.S. The Oxford Medical Publications. Price 5s.

THE author has succeeded in his attempt to provide "a short and practical account of the Diseases of the Ear." The work is eminently practical in character, clear in expression and sufficiently illustrated. The helpfulness of the work will be found at once by the practitioner or student. The accounts given of the technique of examination and of the treatment of the minor affections are excellent. The medical man or student attending an aural clinique will find here valuable help in ready form and may read the book with advantage as an introduction

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to more ambitious and exhaustive works. We consider the book a distinct addition to a series which is already assuming a position of importance in medical literature.

" Consumption : Home Treatment and Rules for Living." By H. Warren Crowe, M.D. Bristol : John Wright & Co. Price 1s. net.

The early appearance of a second edition of this little book is sufficient evidence that it meets a much-felt want amongst members of the profession. There is nothing to be said beyond the recommendation which we accorded to it on the appearance of the first edition.

" The Major Symptoms of Hysteria." By Pierre Janet, M.D., Professor of Psychology in the Collège de France. New York : The Macmillan Company, 1907.

In November and December, 1906, Professor Janet was invited to deliver a course of lectures at Harvard University on the occasion of the inauguration of the new buildings of the Medical School. He chose for his subject the Major Symptoms of Hysteria, and took the opportunity of giving a masterly review of the whole subject. The lectures were delivered in English, and are now published in their original form. It is therefore open to English physicians to become acquainted at first hand and in their own language with the recent work on hysteria which has emanated from the French school of psychology, and to which Professor Janet is the principal contributor.

In these lectures, Professor Janet presents a very complete and often an original conception of the " great neurosis." At the very outset of his study he introduces what will be to many a striking innovation, in according to the " fit of somnambulism which appears spontaneously in hystericals " the first place in order of importance amongst the various symptoms. Not only does Professor Janet look upon this somnambulism as " the most typical, the most characteristic symptom of hysteria," but he makes it the ultimate basis of his conception of hysteria as a whole, and evolves from the study of its phenomena laws which he applies in succession to the elucidation of the other symptoms which he describes. Throughout the malady, it is the " dissociation of consciousness," seen in its most complete form in the fit of somnambulism, which is the characteristic dominating all the phenomena, and to which the ever-varying symptoms are ultimately to be attributed. Coupled with a " retraction of the field of consciousness," this dissociation accounts, not only for the three chief stigmata—suggestion, absent-mindedness and alternation—but also for the motor and sensory phenomena which are such prominent features of the disorder. Thus Professor Janet's definition of hysteria reads as follows: " A form of mental depression characterised by the

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retraction of the field of personal consciousness and a tendency to the dissociation and emancipation of the systems of ideas and functions that constitute personality."

It is impossible in a short review to attempt any description of the detailed clinical study which is contained in these lectures. It must suffice to say that they form a fascinating study, the outstanding features of which are clearness of conception and clinical demonstration, and a masterly ordering of the successive steps by which the ultimate issue is arrived at.

"A System of Medicine." By many writers. Edited by THOMAS CLIFFORD ALLBUTT, M.D., F.R.C.P., F.R.S., etc., and HUMPHRY DAVY ROLLESTON, M.D., F.R.C.P. Vol. iii. London: Macmillan & Co. Ltd., 1907. Price 25s. net.

THIS volume is mainly a rewritten successor of Vol. iii. of the original edition. In the articles on Rheumatoid Arthritis and Osteo-Arthritis a clear distinction is drawn between these diseases, which is a new departure. There are new articles on Pulmonary Osteo-Arthropathy, by Dr. Batty Shaw; Achondroplasia, by Dr. Poynton; Congenital Hypertrophy of the Pylorus, by Dr. Still; and on the Bacteriology of Diarrhœa, by Dr. Slater. Other sections are enlarged; thus that on diseases of the peritoneum is prefaced by an account of Shock, by Dr. T. G. Brodie, and made more valuable still by a clear description of the general pathology and bacteriology of the disease. In the section on Diseases of the Rectum and Anus is an excellent coloured plate giving some appearances of the interior of the rectum as seen with the sigmoidoscope.

The volume contains the last published work of the late Dr. Dreschfeld, on Gastric and Duodenal Ulcer. This has been largely added to, and, as the preface says, "is one which in any circumstances would have commanded attention"; and the editors add that in Dr. Dreschfeld they "lament the death of a colleague whose scientific methods, clinical experience, and large and accurate learning placed him in the first rank of contemporary physicians."

The whole series of articles in this new volume seem to us to be most excellent. The editors have done their work in a most praiseworthy manner, both in their choice of contributors and in the due allotment of space in proportion to the importance of the various subjects dealt with in the volume. They have also written some of the most important sections themselves, Dr. Allbutt's papers on Mountain Sickness, Neurosis of the Stomach, Dilatation of the Stomach, and Dr. Rolleston's on Diseases of the Œsophagus, and on Diseases of the Small Intestine being of the greatest interest and value.

We find the System most useful to us in our own work, and

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can recommend it in the strongest terms to the general practitioner and to the research worker in clinical medicine and pathology, to the latter of whom the excellent references are invaluable.

In continuation of his excellent manuals on Dermatology Dr. Jessner, of Königsberg has published "Die ambulante Behandlung der Unterschenkelgeschwüre" ("The Out-patient treatment of Leg Ulcers" may be given as a translation). The writer enters very fully into the significance of ulcers of the leg from a social standpoint, and points out that the disease is a happy hunting ground for quacks largely by reason of its neglect by the medical profession. Everyone knows that rest in bed will cure the majority of simple leg ulcers. The present work is an attempt to show that a high degree of success can be obtained even with patients whose circumstances deny them rest. One envies Dr. Jessner his success, for evidently his exceeding skill is matched by the intelligence and docility of his out-patients. Here one's ideals in the out-patient treatment of leg ulcer are prone to be most rudely assailed. One even counts it no small degree of success to keep the limb tolerably sweet and clean. Dr. Jessner deals completely with the causes of leg ulcer —venous stasis, trauma and micro-organisms, with their train of complications. He deals also with ulcers due to specific constitutional causes, such as syphilis, and emphasises the difficulty in diagnosis often met with where both syphilis and circulatory obstruction operate as factors. Sometimes syphilis can only be recognised by judging the results of treatment. Scrofula, says the writer, is rarely seen complicating a leg ulcer in connection with venous stasis. Our experience does not altogether confirm this. Among other causes of ulcus cruris he gives, of course, diabetes, arterio-sclerosis in old people and the many causes of venous stasis itself.

There is nothing especially noteworthy in the author's account of the constitutional treatment of leg ulcers. He appears unaccountably to have overlooked the necessity which obtains in many cases of treating concomitant constipation. Finally, he reverts again to syphilitic ulcers, saying very properly that a course of mercury is an excellent adjunct to one of potassium iodide in tertiary cases. But we do not agree that potassium iodide is absolutely valueless in other than specific cases.

Chief stress is laid upon local treatment, the chief indications being (1) direct treatment of the ulcer and its immediate neighbourhood; (2) treatment of stasis. The author prefers the method of local treatment by Unna's zinc-gelatin, and describes this exhaustively. The various stages of dressing are: (1) Cleansing the limb with soap and water, followed by 50 per cent. spirit, and benzine to remove traces of old dressing. (2) Dressing the ulcer. Here the various well-known indications for interfer-

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ence are described. For sluggish granulations the writer finds iodoform the best, where tolerated, or hot fomentations. The various iodoform substitutes (which are rightly designated inferior to the original) are described, amongst the best being *crurin*. Superfluous granulations are treated by scraping and 10 per cent. silver nitrate, after cocain, and airol or bismuth subnitrate dusted over. A piece of protective silk is laid over the wound. For painful ulcers, " which are generally small-sized," orthoform is recommended, but the practitioner must be on the look out for intolerance to this drug in certain cases. "Anæsthesin" may be substituted, but even this is not invariably well borne. Painting the wound with cocain and afterwards liquid carbolic acid is advised where painful nerve-endings are exposed. The dermatitis surrounding the ulcer requires treating. If, for example, this is acute and vesicular, the surface should be painted with 2—10 per cent. silver nitrate and dressed with a soothing powder or paste. (3) In the next stage a layer of cotton wool is placed over the silk protection, and then the zinc-gelatin is applied everywhere round the limb except immediately over the wound. Finally, layers of gauze and stockinette are applied. This whole dressing may be left for a week without renewal. After healing an " after-cure " is called for. For this the zinc-gelatin dressings and bandaging are necessary. These may be changed every fortnight for some time longer. Finally, some form of elastic compression must be constantly worn. The author states that by these means 90 per cent. of his cases are healed, though he does not say how long they remain so. It is but justice to him to say that this is but a sketchy account of his methods, which he describes in this book with characteristic love of detail, impossible of reproduction here.

In " Kokkogene Hautleiden," by the same author, we have a lengthier treatise on coccogenic skin disease. The list of dermatoses placed to the credit of staphylococci includes Bockhart's Impetigo, Impetigo Contagiosa (a disease which most other writers claim as streptococcic in origin), and Impetigo Herpetiformis. Also Coccogenic Folliculitis and Coccogenic Sycosis, boils and carbuncle. Under the streptococci heading the writer gives Erysipelas, Lymphangitis and Phlegma.

Pus cocci do not inevitably produce pustulation (*e.g.*, cutaneous erysipelas), and, on the other hand, a pyo-dermatitis is not necessarily coccogenic—it may be the result of chemical irritation, as in tar-acne. The mode of invasion of a skin by pus cocci may be exogenous. Germs may gain entrance from without through abrasions or through the glandular openings, particularly the sweat glands. Sweat secretion would appear to afford a better pabulum than sebum. Mehanical means—rubbing and stretching the skin—helps ingestion of cocci into follicles. A slight cuticular abrasion, such as a scratch-mark, is

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even more liable to infection than a deeper wound, because in the latter case there is a greater amount of cleansing discharge. Again, infection may be endogenous, the cocci arriving at the skin through the blood or lymph channels. In this event the earlier lesions are deep-seated, involving the papillary bodies. It is not always clinically possible to distinguish between the two modes of invasion. The primary source of endogenous invasion may be the digestive, urinary or respiratory tracts, or a coccic abscess in any organ.

The majority of cases of pustular skin affections are due to staphylococci. The characteristic effect where these germs have once penetrated the horny layer is leucocytic attraction, and the formation of a miliary abscess, generally between the horny and prickle-cell layers. There is a rapid tendency to limitation of the lesion. In the case of infected follicles, matters are more complicated. There may be a single folliculitis, or peri-folliculitis with a necrotic process such as is seen in furuncle.

In general it may be said that staphylococcic infection gives rise to no great amount of surrounding inflammatory infiltration. Streptococcic signs, on the other hand, are more markedly inflammatory in the corium and subcutis. Impetigo contagiosa is described in its typical infantile form. We see no mention of the commonly-occurring clinical varieties of this disease. In discussing treatment, moreover, it is surprising to find boracic ointment of Tannoform recommended in preference to the mercurial preparations commonly used with success in this country. We have often seen boracic ointment prove absolutely futile in Impetigo contagiosa. An account of Impetigo Herpetiformis seems out of place in this work. But little is known of the pathology of this rare and fatal companion to pregnancy, and the fact that staphylococci are found in the lesions would not seem sufficient to justify its inclusion here.

An excellent account of the various forms of pustular folliculitis follows. This disease may be due to direct bacterial infection, may be part of a more general process such as Eczema, or due to external or internal chemical irritants such as potassium iodide.

There is nothing noteworthy or new in the treatment recommended for acne vulgaris or coccogenic sycosis. X-rays are recommended as a good mode of epilation in the latter complaint. Much space is given to furunculosis. The pathology of this affection is excellently given, and the various modes of origin of boils (superficial and deep infection) described. It is stated that furunculosis may be solely due to chemical irritation. Classical methods of treatment are given, but we note that when surgical aid is required the Author prefers the actual cautery to the knife. In carbuncle prompt surgical treatment with the knife is recommended. Erysipelas is fully treated, but we are surprised so scientific a writer should recommend the patients'

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room to be illuminated with red light. Ichthyol is advised as the best form of local treatment in Erysipelas, an opinion with which most will agree. A somewhat qualified approval is given of serum-therapy in streptogenic affections.

"Insanity and Allied Neurosis." G. H. SAVAGE, M.D., F.R.C.P., and E. W. GOODALL, M.D. Cassell and Co., Ltd. Price 12s. 6d.

IN the fourth edition of this work, Dr. Savage with the collaboration of Dr. Goodall has introduced several improvements, notably the addition of plates illustrative of points in the pathological anatomy of some of the forms of mental disease. The manual is, however, essentially a clinical one, and each clinical variety is amply and aptly illustrated by a case, a considerable aid to the student in appreciating a chapter such as "Delusional Insanity," in which one finds auditory hallucinations play an important rôle in altering the conduct of the patient. Throughout, the book is full of practical hints on diagnosis and prognosis, is written in a free and lucid style, and can be highly recommended to students and practitioners, for whose use the work is intended.

"A Text-book of Mental and Sick Nursing." By ROBERT JONES, M.D., B.S. Lond; F.R.C.S. Eng.; F.R.C.P. London; Resident Physician and Superintendent Claybury Asylum, etc. Scientific Press, Ltd. Price 3s. 6d. net.

THIS is a book of 222 pages, interleaved in order that notes may be taken of special clinical points, etc. The opening chapters contain sufficient anatomy, physiology and psychology to guide the asylum attendant who wishes to take an intelligent interest in mental work, and to understand what mental disease really implies. Chapters VII. and VIII. are especially good in this respect, the composition of the mind being simply explained along with the instincts, habit and conduct, reflex and automatic action. Fully two-thirds of the book deals with the duties of a mental nurse and rules for the treatment of mental cases. In this part of his book, Dr. Jones has gone into considerable detail, discussing the therapeutic value of baths, physical exercise, electricity, diet, massage, etc. The whole work is a great advance on any manual at present in use in our asylums.

CORRECTION.—"Hypnotism: Or Suggestion and Psychotheraphy." By AUGUST FOREL. London: Rebman, Ltd.

WE regret that in our review of this work (January, 1908) it was stated that the book contains 866 pages and is well illustrated, whereas it is a crown 8vo volume of 382 pages and no illustration. We hope that by this correction we can emphasize an important point, namely, that in addition to its other valuable characteristics which we referred to in our notice, the book is concise and of convenient size.

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THE MEDICAL CHRONICLE.
A MONTHLY RECORD OF THE
Progress of Medical Science.

NOTES ON A CASE OF PHOSPHORUS POISONING, WITH SOME OBSERVATIONS ON THE AMINO-ACID EXCRETION.

By F. H. EDGEWORTH, M.B., D.Sc.,

Professor of Medicine, University College, Bristol; and Physician to the Bristol Royal Infirmary;

and

I. WALKER HALL, M.D.,

Professor of Pathology, University College, Bristol; and Pathologist to the Bristol Royal Infirmary.

ON September 16th, 1906, a non-pregnant woman, 26 years old, swallowed, with suicidal intent, the heads of a box of 'England's Glory Matches.' The quantity of yellow phosphorus present in a similar box was 0·0619 grammes.[1]

The next day she vomited frequently, and took four Beecham's pills in the hope of 'passing' the poison.

On the morning of the 16th, her bowels were opened several times, but she continued to vomit, and was admitted to the Royal Infirmary. She complained only of the vomiting and did not have any pain either then, or at any subsequent period of her illness. The temperature was normal. The tongue was tremulous, moist, and covered with a yellow fur. The skin of the abdomen and the sclerotics were slightly but distinctly yellow in colour. Her pulse was 80 per minute, irregular in time, and of low tension. The cardiac apex beat was in the 5th space, one inch external to the nipple line, and there was an apical systolic murmur conducted into the axilla. This was

1. This was determined from the weight of the scrapings of the matches in a box and from the percentage composition (kindly supplied by the makers) of the paste used in their manufacture.

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probably due to rheumatic fever from which she had repeatedly suffered. There was no symptomatic or physical evidence of cardiac failure. The abdomen, which was not distended, was uniformly tender on pressure; it moved with respiration. The hepatic dulness on percussion extended from the 6th rib in the nipple line to the costal margin. The patient complained of pain when the dull area was pressed upon or percussed. The spleen was not enlarged.

There was retention of urine.

The patient was given ℥ xl. of French turpentine every six hours for the first day, and subsequently ℥ xl. of sanitas four times a day.

She vomited twice on the day of admission. No phosphorus was detected on distillation of this vomit. On September 17th she vomited once—but not subsequently. On September 19th the jaundice was deeper and had spread to the rest of the body. The liver extended to 1 inch below the costal margin. On September 21st the jaundice was still more marked, and the uniformly enlarged liver extended down to the level of the umbilicus; it was very tender and soft.

On the 22nd the liver was slightly less in size, its lower edge being 1 inch above the level of the umbilicus. The pulse was now regular in frequency. The jaundice was slightly less marked. Examination of the blood showed 5,500,000 red corpuscles, 75 per cent. of hæmoglobin, and 4,480 white corpuscles per cb.mm. On September 24th, the lower edge of the liver was only 1 inch below the costal margin, and the jaundice was still less.

On October 1st the abdominal tenderness had disappeared, and a catheter was no longer required.

On October 4th the jaundice was nearly gone, and the liver was no longer palpable; its lower edge as determined by percussion extended to the costal margin.

Two days later the patient went home, at her own request. She was quite well twenty-three days subsequently; she did not subsequently return, though requested to do so, and we failed to trace her.

The urine, drawn off by catheter shortly after admission, was

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reddish brown in colour, s.g. 1034, and contained neither albumen, sugar nor blood. Determinations were made, day by day, of the total nitrogen, urea, ammonia, and purins, excreted.

Day.	Total nitrogen. gm.	Urea nitrogen.[1] gm.	Ammonia.[1] gm.	Purin nitrogen. gm.
3	7·6375	7·034	·3158	·1560
4	9·8751	9·101	·3576	·1842
5	9·2064	8·410	·4095	·2730
6	9·2840	8·192	·2565	·1522
7	9·9584	8·705	·8736	·1640
8	12·6112	11·672	·5376	·1328
9	lost.			
10	12·4684	10·965	·7856	·1400
11	10·8528	9·763	·5236	·1520
12	11·6325	10·807	·6585	·1324
13	10·0005	9·143	·6174	·1410
14	10·1908	9·216	·6623	·0900
15	10·0680	9·304	·6697	·1210

The diet was a weighed hospital low diet, with a constant quantity of fish.

The nitrogen output corresponded fairly well to the intake. The ammonia output was not high. The purin nitrogen was normal except for a slight increase on the fifth day. Hæmatoporphyrin, sarcolactic acid, and sugar were absent. Urobilin was found in considerable quantities during the third and fourth days, and in traces for the next three days. Bile-pigments were present for three days and then disappeared. Good reactions for indican were obtained during the first seven days.

Wohlgemuth[2] has shown that, experimentally, the urine of animals poisoned by phosphorus contains arginin in addition to the usual amino-acids, and has recorded a case in which that substance was present in the urine of a patient who died from phosphorus poisoning nine days after eating all the match-heads in a large box of matches. These facts lend additional interest to the observations of Wakeman[3] upon the decreased quantity of arginin present in the hepatic cells in cases of

1. The estimations of the ammonia and urea were carried out by A. J. Taylor, M.P.S., dispenser to the Bristol Royal Infirmary.

2. Wohlgemuth, J. Zur kenntnis des Phosphorharns. Zeitschr. f. physiolog. Chemie. Bd. 44, Heft. 1, S., 75.

3. Wakeman. Veränderungen der Leber bei der Phosphorvergiftung. Zeitschr. f. physiolog. Chemie. 335, 1904. Kossel. Berlin Klin. Wochenschr., 41, 1904.

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experimental phosphorus poisoning when compared with healthy liver tissue.

It consequently seemed advisable to examine the urine of this patient for diamino-acids as well as for mon-amino-acids. Using the napthalene-sulpho-chloride methods, glycocoll, tyrosin, and leucin were all identified. Leucin occurred in large amounts for three days, and in small amounts for the succeeding ten days. Small quantities were still demonstrable in the urine obtained twenty-three days after the patient left the Infirmary. Tyrosin occurred in smaller quantities. As the presence of these mon-amino-acids is now generally accepted as "proved" in cases of phosphorus poisoning, quantitative estimations were not undertaken. The urine was accumulated until six litres were obtained and this quantity was used for determination of arginin.

Method. After precipitation by the addition of excess of lead acetate, and removal of the lead by H_2S, the filtrate was evaporated at 40°C. in vacuo to a thin syrup. Ether was then added in order to remove substances which might interfere with subsequent stages. The ether was separated off, and an excess of phosphotungstic acid was added. This precipitate was treated according to the method of Wohlgemuth.[1] When the purins, etc., were removed, the addition of an alcoholic solution of picrolonic acid is followed by the appearance of crystals if arginin is present.

No arginin was present.

In view of the remarks of Wohlgemuth in connection with the stability of the nuclein of phosphorus livers, the urine was also examined for the presence of pentose.

Method.[1] 500 cc. of urine were evaporated on a waterbath down to 200 cc. 200 cc. of alcohol were then added. After standing for four hours the deposited urates and organic salts were filtered off, and the residue well washed with alcohol. The filtrates were evaporated to a thin syrup and an equal quantity of 99 per cent. alcohol was added. After standing for two hours, the solution was filtered, and di-phenyl-hydrazine

1. For some of the details connected with this method we wish to express our indebtedness to Dr. J. Wohlgemuth.

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added to the filtrate. The solution was then warmed on the water bath for half an hour in order to get rid of the alcohol. When pentose is present the crystals deposited are collected twenty-four hours later, washed with 30 cc. of 30 per cent. alcohol, dried at 80°C. and weighed (1 gm. arabinose equals 1·4 gm. diphenyl-hydrazine). The method gives a yield of 99 to 99·8 per cent.

No pentose was present.

In looking over the clinical records of this case of phosphorus poisoning, it is seen that vomiting occurred on the second, third and fourth days after taking the match heads, and then ceased. The rapidity and extent of the alterations in the size of the liver were most striking. The liver was of normal size in the fourth day, it began to swell on the fifth, reached its maximum size on the seventh, when it extended down to the level of the umbilicus; it began to diminish in size on the eighth, and was of normal dimensions on the twentieth day. The change in the liver began, however, before any enlargement took place, for it was very tender on percussion in the second day, slight jaundice was already present, and leucin and tyrosin were demonstrable in the urine. The jaundice also attained its maximum on the seventh day, and then declined *pari passu* with the diminution in the size of the liver. It was a little odd that the jaundice began in the skin of the abdomen. Though the liver attained its normal size by the twentieth day, yet pathological changes were still going on, for leucin was demonstrable in small amounts in the urine on the forty-fifth day. The retention of urine was probably connected with the tenderness of the abdomen; it is a somewhat exceptional feature. The irregularity in the action of the heart was probably due to direct action of the phosphorus on the cardiac muscle.

The experimental evidence already accumulated suggests that we may exclude decreased oxygen supply to the tissues as a cause for the effects met with in phosphorus poisoning. There are, however, distinct signs of a diminished oxidative capacity of the tissue cells, and it may be taken that phosphorus acts directly on the cell protoplasm. It has a selective affinity for certain cells, especially those of the liver, kidneys, and heart.

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This action has been chiefly studied in connection with hepatic cells, and appears to result in an excessive cleavage of albumin, with formation of amino-acids. The extent of this production determines—to some extent—our view of the oxidative capacities of the cells. On the one hand, the assimilative powers of the organism for the products of albumin cleavage are not destroyed, although they are unequal to dealing with a sudden liberation of large quantities of these substances. On the other hand, the assimilative powers may be so depressed that even small amounts of the liberated acids are not fully dealt with. Again, it is quite conceivable that a condition of marked destruction might coincide with one of deficient assimilation.

In this instance, as far as the acute manifestations were concerned, there was an explosive type of tissue destruction, the amino-acids being rapidly eliminated, followed by a rapid return to normal conditions. It illustrates the view that in phosphorus poisoning, the total assimilation powers for the albumin cleavage products are unimpaired though they are not able to deal with any extraordinary quantities. The absence of arginin from the urine of our case may be due to the fact that despite the severity of the earlier symptoms the later ones were less marked and the patient lived beyond the usual period of the severe cases. It is a matter for regret that we were unable to make further examinations of the urine at later dates—the patient was lost sight of and could not be traced—for although the immediate destruction of hepatic tissue appeared to cease, a consequential 'inadequacy' of the liver might have arisen.

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CHOLESTEROL, FLUID CRYSTALS AND MYELIN FORMS.

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(From the Pathological Laboratory, University of Manchester.)

NUMEROUS observers have noticed in the tissues in various conditions globules closely resembling fat globules, but differing from these in staining but faintly with ordinary fat stains and in being anisotropic. Such a globule when examined with polarised light with crossed Nicols, presents the appearance of a bright globule divided into four quadrants by a black cross which has its arms parallel to the axes of the Nicols.*

In examining frozen sections of carcinomata and other tumours fixed in formalin it is common to find masses of fine acicular crystals. These may be either intra- or extra-cellular and they are often quite apart from any evident degeneration. On placing such a section on the warm stage and heating, the crystals melt at temperatures varying in different specimens into a group of globules closely resembling fat globules. On now cooling the specimen the globules become anisotropic. This distinguishes these crystals from ordinary fat crystals which do not give rise to anisotropic globules under these conditions. These anisotropic globules are persistent for a long time at room temperature but, in some cases, they undergo subsequent solidification. In some cases similar globules are found in the section without previous warming. I have also seen these globules in some cases of supposed fatty degeneration of the kidney and liver and in some other conditions. Normal formalin-fixed adrenals invariably show masses of crystals which become anisotropic globules on warming and subsequent cooling.

On treating a section containing these anisotropic globules

* N.B.—All anisotropic globules do not show this cross which depends on the internal structure of the globule but, in this paper, only those globules which have this characteristic are considered.

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with 85 per cent. sulphuric acid the globules usually assume a brown or purple colour, the presence of cholesterol being thus indicated. If the section be stained with Nile blue and heated on the stage the globules sometimes become stained a deep blue colour. This indicates the presence of fatty acid. Sometimes, on the other hand, the globules are stained pink, indicating the absence of free acid.

Sometimes, along with the globules, cylindrical forms are seen which closely resemble the myelin forms seen on treating lecithin with water.

With the object of finding out the conditions under which such globules and myelin forms occur I have undertaken the following investigation. The histological results I shall leave for a future occasion, confining myself here to some observations on cholesterol and fatty acids.

Materials used in the Investigation.

Cholesterol. The cholesterol used in this investigation was prepared from gall stones and purified by recrystallisation from absolute alcohol until it showed a melting point of at least 145°C. If cholesterol with a lower melting point be used it is apt to lead to erroneous conclusions. Commercial cholesterol contains admixed fatty acids and requires a considerable amount of purification before it can be used. For one sample of cholesterol (and for samples of cholesterol bromide and cholesteryl chloride and oleate) I am indebted to Dr. Craven Moore; the others I prepared myself.

Of the cholesteryl esters I used chiefly the palmitate which is easily prepared pure by heating together cholesterol and palmityl chloride. I have also examined the chloride, formate, acetate, propionate, and oleate.

In connection with fluid crystals I examined for the purposes of comparison the substances p-azoxyanisol, p-azoxyphenetol, and the octyl and cetyl esters of p-azoxycinnamic acid. These are representatives of substances showing Lehmann's "flüssige Kristalle" as opposed to the "fliessende Kristalle" of the cholesteryl esters. These substances were obtained from Schuchard. The other chemicals were obtained from Kahlbaum.

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The following fatty acids and their potassium salts were used:—

$C_{n-1}H_{2n-1}COOH$	Formic, Acetic, Propionic, Butyric, Isovaleric, Caproic, Caprylic, Nonylic, Lauric, Palmitic Stearic.
$C_{n-1}H_{2n-3}COOH$	Undecylenic, Oleic, Elaidic, Erucic.
$C_{n-1}H_{2n-5}COOH$	Linoleic.
$C_{n-1}H_{2n-2}OH.COOH$	Lactic.
$C_{n-1}H_{2n-3}(OH)_2COOH$	Dioxystearic.

I also made use of the neutral fats triolein, tripalmitin, tristearin, and mono- and di-palmitin (prepared from the corresponding chlorhydrin and sodium palmitate); also the ethyl, cetyl, phenyl, menthyl, and linaloyl palmitates prepared from the corresponding alcohols and palmityl chloride.

The microscope stage that I used was heated with water and so arranged that, by a series of stopcocks, either hot or cold water could be supplied to the stage, and the outflow from the stage could be made to pass at will through a vessel containing a gas regulator which regulated the temperature of the water bath from which the hot water was obtained. With this arrangement the temperature could be raised or lowered slowly or quickly and any temperature between 14° and 95°C. —corresponding to corrected temperatures of 15°—79°C.— could be obtained and maintained for any length of time. The temperature of the preparation in the field of view was standardised by observing the melting points of various pure chemicals and comparing them with the melting points observed in capillary tubes. The stage was used in conjunction with polarised light. The temperatures given in this paper are Centigrade and, where the observations have been made on the stage, the necessary corrections have been made.

Cholesterol.

I do not propose to consider in detail the characters of cholesterol and cholesteryl esters but only to give an account of certain observations which have been made during this investigation.

If some dry cholesterol be heated to 135°—*i.e.*, 10° below its melting point—between two cover glasses it softens and

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becomes yellow and, at the same time, a sublimate appears on the upper cover glass in the form of rectangular plates. The sublimate gives the colour reaction with sulphuric acid. I have not investigated this substance any farther.

Cholesterol when heated to a temperature of 135° for three hours in a capillary tube becomes yellow and liquefies. This substance on cooling solidifies to a brown amorphous mass resembling resin which, under certain conditions, can be obtained in a partially crystalline condition. On heating it softens at a temperature below 100° and becomes perfectly clear and fluid at about 128°. This change in cholesterol does not occur if the melting point tube be closed even on heating for several days nor does it occur if the heating be carried out in a stream of CO_2 to 140° for 15 hours. If, on the other hand, the heating be carried out in a stream of air or oxygen the change is rapid, the change of colour in the case of oxygen being noticeable in 5—10 minutes. During the process the cholesterol gains in weight. This yellow substance is, therefore, an oxidation product of cholesterol. I have not investigated it any farther.

Fluid Crystals.

Anisotropic globules are known to occur under certain conditions in some of the substances which are characterised by having a crystalline fluid phase. In this condition the substance is composed of crystals which are themselves fluid and the crystalline fluid may be extremely mobile or as viscous as glycerine. The solid crystals of the majority of such substances on being heated melt at a definite temperature into a turbid crystalline fluid which, on further heating, becomes clear and amorphous at a temperature which also is definite for each substance. The crystalline fluid phase is thus a stable condition between two temperatures which are fixed for each substance. Thus cholesteryl oleate crystallises in rhomboid plates which melt at 38°–39° to a crystalline fluid which clears at 49°. On cooling, the fluid crystals appear at 45° and these are gradually replaced by the solid crystals on standing for some time at room temperature, solidification being complete after 12—18 hours. In this case then the crystalline fluid phase

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is a stable condition between 39° and 49° and a metastable condition below 39°. We can represent the phases of cholesteryl oleate as follows:

CRYSTALLINE SOLID ⇄ CRYSTALLINE FLUID ⇄ AMORPHOUS FLUID.

In some cases, however, the conditions are somewhat different. In these cases, of which examples are cholesteryl chloride, formate, acetate, and palmitate, the solid substance melts directly into the amorphous fluid and the crystalline fluid phase exists as a metastable condition between two more or less definite temperatures below the melting point of the solid crystals.

Thus on heating cholesteryl palmitate it melts at 77°–77·5° to an amorphous, slightly opalescent fluid which loses its opalescence at 80°. On cooling slowly the fluid becomes opalescent at 80°, fluid crystals appear at 76°, and solid crystals at 71°, in the form of radiating needles or prisms. If the crystalline fluid phase is kept for some time at a constant temperature the fluid crystals are gradually replaced by large solid tabular crystals. On heating the radiating masses of crystals obtained by cooling they change into the tabular stable form before melting. All these changes can be observed directly on the warm stage.

The phases of cholesteryl palmitate can be represented as follows:

CRYSTALLINE SOLID I. (PLATES) ⇄ AMORPHOUS FLUID.
↑ ↙ ↓
CRYSTALLINE SOLID II. (NEEDLES) ← CRYSTALLINE FLUID.

Similarly on cooling cholesteryl chloride which has been melted (M.P. 94°) very slowly the solid crystals may appear directly from the clear fluid. If it is cooled rapidly fluid crystals appear and are remarkably persistent lasting for several hours at room temperature and showing iridescent colours, but they are eventually replaced by solid crystals. On warming such a preparation the solid crystals appear more rapidly and spread in radiating masses through the crystalline fluid. If cooling take place moderately slowly as by placing the preparation on the stage at 79° and cooling slowly, fluid crystals appear

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at 64° and remain to about 52°, when the solid crystals appear. If the crystalline fluid phase is heated above 64° the fluid clears at this point and solid crystals appear in the clear fluid. The acetate and formate behave in a similar way. All the cholesteryl esters that have been examined show one or more crystalline fluid phases and many of them have more than one solid phase. I have not been able to detect a crystalline fluid phase in the ethyl, cetyl, menthyl, linaloyl, and phenyl palmitates.

The soaps are another group of substances which can be obtained in a crystalline fluid phase. It has for some time been known that the alkaline oleates show this condition and I have now examined the potassium salts of the fatty acids mentioned above. Of these salts all except the lactate, formate, acetate, and propionate ? can be obtained in a crystalline fluid phase. All these salts were obtained in the crystalline anhydrous condition from alcohol. On placing some of the solid crystals on a slide and adding a drop of water the crystalline fluid condition is seen as the salt dissolves forming a transition layer between the anhydrous crystals and the solution. With regard to the existence of fluid crystals in the propionate I am doubtful. If the condition exists at all it is extremely transient. In the butyrate the layer is very thin and difficult to see owing to the extreme solubility of this salt. With the salts of the higher acids the crystalline fluid condition is more evident the higher the acid. The palmitate and stearate show this condition in spite of the fact that they are insoluble in water at room temperature. Sodium palmitate shows the same condition only on warming with water.

As to the action of water in producing this condition it is conceivable that the addition of water produces hydrolysis and that the fluid crystals consist of a mixture of potassium hydrate and fatty acid thus corresponding to the cholesterol-fatty acid mixtures mentioned below. Against this, however, is the fact that these salts are soluble in water, and hydrolysis in solution only occurs in considerable dilution. It seems more probable that the crystalline fluid condition is a hydrate of the salt, the water existing as water of crystallisation.

It appears that the potassium salts of any of the fatty acids

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can be obtained in a crystalline fluid condition provided that the corresponding acid has an oily nature.

Anisotropic Globules.

If a mixture of cholesterol and a fatty acid is melted on a slide and the preparation allowed to cool, the cholesterol separates out in the crystalline condition and, in advance of the growing crystals, clouds of anisotropic globules appear which subsequently in most cases solidify, merging in the general mass of crystallisation. Sometimes the globules retain their condition among the solid crystals and reappear on warming. On solidification that part of the preparation in which the globules appear always shows smaller crystals than other parts.

All the fatty acids tried give these globules except lactic, formic, acetic, propionic, butyric? isovaleric? and caproic? but I have not tried the last three fully.

Better results can be obtained if this experiment is carried out quantitatively. If we mix the cholesterol and the fatty acid in equimolecular proportions and melt the mixture we find that, on rapid cooling, the anisotropic globules appear simultaneously over the whole preparation. Later on these globules coalesce to form fluid crystals which are often arranged in interlacing strands forming an open network, the appearance being very similar to that seen in ammonium oleate and other soaps. These fluid crystals are often very persistent lasting at room temperature for some hours. Solidification eventually takes place in the form of bundles of minute needles which bear a striking resemblance to the crystals met with in tumours, adrenals, etc. These crystals are apparently crystals of a mixture or a loose combination of cholesterol and the fatty acid since on heating they are dissociated, the fatty acid melting and the cholesterol crystals floating in the melted acid. The temperature at which the globules appear is often somewhat below the melting point of the fatty acid but varies with the proportion of the two constituents. In some cases the addition of a drop of water facilitates the appearance of the globules and fluid crystals.

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For example, if cholesterol and palmitic acid in equimolecular proportions be melted together on a slide and the preparation be cooled moderately rapidly the globules appear at about 58°. The globules then run together and form strands of fluid crystals which eventually solidify in the form of minute wavy needles. If we now heat the preparation the crystals partially melt at about 58° and small crystals of cholesterol are seen floating in the melted acid. These latter crystals do not melt at any temperature obtainable on the stage (79°), and the preparation must be heated above this temperature before the globules and fluid crystals can be again obtained on cooling. If the preparation is from the first cooled very slowly the globules are apt to fail the cholesterol crystallising out in the solid form. Thus this mixture differs entirely in its properties from cholesteryl palmitate. Similar results can be obtained with other acids.

I have not fully investigated proportions other than the equimolecular. This appears to be the most favourable proportion, but proportions of one molecule of cholesterol to two or three of the acid also show very well in some cases.

In the case of the lower fatty acids all the first six acids of the acetic acid series have a remarkable solvent action on cholesterol. If a solution of cholesterol in one of these acids be allowed to evaporate at room temperature, crystals are obtained which contain both constituents but which are not the esters. If the cholesterol-acid mixture is heated the ester is formed, particularly in the case of formic acid. Thus a solution of cholesterol in propionic acid crystallises in long crystals which can be obtained free from any residual acid but this substance differs entirely in its characters from cholesteryl propionate. If these crystals are heated they are dissociated, propionic acid being set free. They are also readily decomposed by a solution of Sodium carbonate. The propionate, however, is a very stable compound and heat and boiling sodium carbonate solution have no effect on it.

We find, then, that cholesterol has the remarkable character of being able to take up fatty acids to form loose combinations which are not the esters. Presumably in these combinations

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the acids exist as "acids of crystallisation." This subject is being further investigated by Dr. Craven Moore.

I have not been able to obtain these anisotropic globules on mixing cholesterol with the triglycerides. I once found them with tripalmitin but after many attempts I have been unable to repeat this observation and I conclude that in this case some contamination had taken place.

Apart from the fatty acids, mixtures of cholesterol with cetyl alcohol or glycerine give precisely similar results. Presumably in this case also we have the cholesterol crystallising with "alcohols of crystallisation." In this case we have two substances neither of which shows a crystalline fluid phase, and between which no compound of the nature of an ester can be formed under the conditions of experiment, yet, when mixed together and melted the resulting substance shows on cooling anisotropic globules and fluid crystals.

Mixtures of cholesterol with mono-and di-palmitin behave in a similar way.

Mixtures of cholesterol with the following substances gave negative results:—phenol, thymol, menthol, azobenzene, azoxybenzene, napthol, naphthalene, naphthylamine, diphenylamine, paraffins and benzene hydrocarbons, toluidin, aniline, volatile oils, etc., etc.

As to the composition of the globules and fluid crystals the question arises whether they are composed of one of the constituents of the mixture separating out from the other or whether each globule and crystal is composed of a mixture of the two constituents. The latter seems to me the more probable view. Cholesterol has no difficulty in crystallising out as such from an excess of fatty acid or alcohol-glycerine and it is only on certain conditions that the fluid crystals appear. The fact that the only substances with which cholesterol gives these globules and fluid crystals are fatty acids or alcohols and that the experiment fails when we use as substitutes for these substances of similar physical characters such as paraffins, essential oils, or triglycerides goes to show that there is some kind of union between the constituents of the mixture in which the anisotropic globules and fluid crystals appear.

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If we substitute cetyl alcohol for cholesterol in these experiments we do not obtain any anisotropic globules or fluid crystals but, in the case of the fatty acids the mixture appears to crystallise differently from the corresponding ester. Equimolecular mixtures of cetyl alcohol and palmitic acid, for instance, appear to crystallise as a single substance but differently to the cetyl palmitate.

Myelin Forms.

Brücke (1879) and Brockbank (1893) showed that when a crystal of cholesterol is placed in a solution of soap it becomes surrounded by a fringe of cylindrical processes (myelin forms) which appear to sprout out from the crystal and which assume various bizarre shapes. The crystal ultimately disappears the myelin forms floating free in the soap solution. Many of these free forms assume the globular shape; some appear to consist of a capsule containing a more fluid content while the greater number are homogeneous or laminated. If they are examined with polarised light with crossed Nicols, some are seen to be anisotropic, appearing as typical anisotropic globules, while others are isotropic.

These myelin forms are not peculiar to cholesterol. Cetyl alcohol also acts well in soap solution and one of the higher fatty acids may be substituted for either of these and a hydrolysed solution of a potassium salt of a fatty acid, *e.g.*, potassium oleate, shows numerous free myelin forms. The pure soaps, free from fatty acid, do not appear to give myelin forms with water. The most beautiful and varied forms are seen if a drop of ammonia and a drop of oleic acid are allowed to come in contact between a slide and cover glass. Also commercial lecithin, which contains cholesterol, gives myelin forms with water, the lecithin ultimately forming an emulsion or a colloid solution in the water. Lecithin purified by repeated precipitation with acetone does not appear to give myelin forms with water. Cholesterol bromide, cholesteryl palmitate, and cetyl palmitate gave negative results with solutions of the potassium salts.

If a 0·5 per cent. solution of potassium oleate in absolute alcohol be taken and diluted with water from a burette, the

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solution being tested with cholesterol from time to time, it will be found that the myelin forms do not appear until the solution begins to react alkaline to phenolphthalein showing that hydrolysis has commenced. This occurs when the strength of the solution is reduced to about 20 per cent. alcohol. If a watery solution be used, myelin forms occur with the clear solution even if this is made alkaline with caustic potash. They are, however, much more marked if the solution be diluted until hydrolysis commences.

I have endeavoured to stain the myelin forms so as to obtain an idea as to their composition but it is difficult to obtain a satisfactory staining. If the potassium oleate solution be coloured with a basic dye such as fuchsine, any free oleic acid will be coloured an intense red owing to the formation of a colour soap. In this case the cholesterol crystals are seen to be surrounded closely by numerous minute, intensely coloured globules of oleic acid combined with the dye. Again if some cetyl alcohol be coloured red by dissolving in the molten alcohol the base of night blue (prepared by precipitating the watery solution of night blue by caustic potash) and allowed to solidify and a portion be introduced into soap solution, some of the resulting myelin forms will be found to be stained a bright blue showing that they contain free fatty acid which has dissolved some of the cetyl alcohol.

It is not necessary to use soap for the production of the myelin forms. They can be obtained if, instead of a soap solution, an emulsion of oleic acid (prepared with the aid of saponin) be used, and a similar emulsion of palmitic acid is also successful on warming. Also cholesterol contaminated with fatty acid or lecithin gives myelin forms with water.

In order to gain a further insight into this phenomenon I have examined the action of the potassium salts of the before-mentioned fatty acids on cholesterol. All these gave myelin form except the lactate, formate, acetate, propionate, butyrate, isovalerate, and caproate.

Thus the appearance of myelin forms obtained by cholesterol and a soap solution appears to be conditioned by the insolubility of the corresponding fatty acid in water.

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If we examine the myelin forms and free globules we find that they have not all the same characteristics. Some of them are isotropic, others anisotropic. Of the anisotropic forms some can be seen to be composed of minute fluid crystals arranged with their axes at right angles to the free surface while others show no apparent crystalline structure but appear to be composed of layers arranged parallel to the free surface. The crystalline forms exhibit the highest degree of anisotropism and often lose this character on heating, regaining on cooling. They often show iridescent colours. In the stratified forms, on the other hand the anisotropism tends to increase on heating and is not lost at any temperature obtainable on the stage. In this they resemble starch granules which are anisotropic but not crystalline. These forms pass insensibly into the isotropic forms some of which become anisotropic on heating.

The same is true of the globules seen in the tissues. These vary in the intensity of their anisotropism and in the majority this character is lost on heating, while in others it is rather intensified. If the brightest globules are heated until they become isotropic and examined on cooling minute spindle-shaped fluid crystals are seen to appear in them which by coalescing give the typical anisotropic globule.

The appearance of a black cross on the anisotropic globule and the corresponding markings on the cylindrical forms appears to be due to one of two conditions:—either the globules and cylindrical forms are composed of crystals arranged with their axes at right angles to the free surface; or they are composed of laminæ arranged parallel to the free surface.

It seems to me that the introduction of a selenite will help in differentiating these forms, the distribution of colours being different in the two cases, but I have not investigated this point fully.

Myelin forms can also be obtained if pure cholesterol crystals are heated to 130°—140° in glycerine, the crystals becoming surrounded by a fringe of anisotropic cylindrical processes which mostly solidify on cooling. Very good forms are produced by making an emulsion of cholesterol and glycerine at a temperature just above the melting point of choles-

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terol. After cooling, each drop of cholesterol is seen to be surrounded by perfect myelin forms and numerous anisotropic globules float free in the glycerine. Most of these are solid while some remain fluid for a long time at room temperature. Myelin forms can also be obtained if cholesterol be heated on the warm stage with a mixture of alcohol and glycerine.

If cholesterol be warmed with concentrated phosphoric acid myelin forms and anisotropic globules are produced apparently budding out from the crystals.

The explanation of the myelin forms in the case of cholesterol and soap solution appears to be that the cholesterol introduced into, *e.g.*, potassium oleate solution determines the deposition on it of a film of oleic acid in which it partially dissolves and with which it, perhaps, combines, and that it is this film which gives rise to the myelin forms probably by variations in surface tension. The whole process of myelin formation is, in fact, identical with the process of the formation of a spontaneous emulsion. The myelin forms produced with cholesterol and glycerine are probably associated with the cholesterol-glycerine mixture which gives the anisotropic globules. The explanation of the myelin forms given with phosphoric acid is not so clear. Possibly we have to do with another cholesterol-acid mixture but, owing to the different behaviour, the globules appearing on warming rather than on cooling, it is probable that we have to do with a phosphoric acid ester.

We see then that there is a close correspondence between anisotropic globules and myelin forms. When a mixture of cholesterol and a fatty acid shows anisotropic globules, then cholesterol introduced into a solution of the corresponding potassium salt shows myelin forms. Also if a drop of water be added to a mixture which shows the globules and fluid crystals myelin forms shoot out into the water and, at the same time, water penetrates into the mixture. Again, myelin forms, which become free, often assume the globular shape and then appear as anisotropic globules; and also in a mixture of cholesterol with a fatty acid or cetyl alcohol which shows the globules cylindrical and branched forms are often seen exactly resembling myelin forms. In fact, if a cholesterol-fatty acid mixture be carefully

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watched as it cools, the first structures to appear are often extremely long, fine, hair-like threads, often in vigorous movement, and the globules result from these by the sudden contraction of the long threads. These appearances exactly correspond with appearances described in certain cerebro-spinal fluids by Dr. F. C. Eve at the meeting of the British Medical Association in 1907.

SUMMARY OF THE FACTS OBSERVED DURING THIS INVESTIGATION.

1. The crystalline fluid phase of the cholesteryl esters is in some a stable condition at definite temperatures and in others it exists only as a metastable condition at temperatures below that of the melting point of the solid crystals.

2. The potassium salts of all the fatty acids examined except the lactate, formate, acetate, and propionate can be obtained in a crystalline fluid phase at room temperature.

3. Cholesterol gives myelin forms with watery solutions of all the potassium salts mentioned except the lactate, formate, acetate, propionate, butyrate, isovalerate, and caproate.

4. Cetyl alcohol and the higher fatty acids also give myelin forms with solutions of the potassium salts of the higher acids.

5. The myelin forms in these cases are associated with the deposition of fatty acid from the solution on the cholesterol or cetyl alcohol. The fatty acid thus deposited dissolves some of the cholesterol, etc.

6. Cholesterol mixed with a fatty acid—best in equimolecular proportions—forms a mixture, or rather an unstable combination, which behaves quite differently to the corresponding ester.

7. In the case of the higher acids these unstable combinations show anisotropic globules and fluid crystals and give myelin forms with water. The combination is broken up on heating and forms again on cooling. With the lower acids the combinations can be obtained in a solid crystalline condition and are broken up on heating.

8. Cholesterol mixed with cetyl alcohol, glycerine, or mono- or di-palmitin forms unstable combinations which show anisotropic globules and fluid crystals and give myelin forms with water.

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9. Cholesterol also gives myelin forms and anisotropic globules when warmed with concentrated phosphoric acid.

10. Cholesteryl esters, when pure, do not give myelin forms with water nor do they show definite anisotropic globules. If, however, they contain an excess of either constituent they give globules and myelin forms readily.

11. The cholesterol-fatty acid combinations, owing to the formation of myelin forms, can become intimately mixed with water with the eventual formation of an emulsion. This is not the case with the esters which are extremely stable compounds.

12. The crystals and globules in the tissues, in some cases, can be shown to contain cholesterol and a fatty acid which becomes separated on warming. In other cases the globules show no evidence of fatty acid.

13. Anisotropic globules are not necessarily of a crystalline structure. Some are definitely composed of minute fluid crystals arranged radially and these show the highest degree of anisotropism. Such globules often become isotropic on heating regaining their anisotropic characters on cooling. In other globules the anisotropism resembles that of starch and tends to increase on warming. No definite line can be drawn between such globules and similar globules which are isotropic.

14. The same may be said *mutatis mutandis* of the myelin forms. In the crystalline form the crystals are arranged with their axes at right angles to the free surface whatever shape the form may take.

Conclusions deduced from the foregoing facts.

If we collect these observations and attempt to deduce conclusions from them we arrive at the following results:—

1. The potassium salts of those fatty acids which are of an oily nature can be obtained in a crystalline fluid condition. This condition probably represents a hydrate of the salt.

2. Cholesterol and some other substances such as cetyl alcohol, or one of the higher fatty acids, give myelin forms with the watery solutions of the potassium salts of those acids which are of an oily nature and which are insoluble in water.

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3. These myelin forms are due to variations in surface tension acting on the film of cholesterol—fatty acid mixture formed by the deposition of fatty acid from the solution on the cholesterol.

4. Cholesterol has the peculiar property of combining with fatty acids to form crystalline compounds which are quite different from the esters. In these combinations the acids presumably exist as "acids of crystallisation."

5. Cholesterol forms with alcohols similar crystalline combinations in which the alcohols exist as "alcohols of crystallisation."

6. Anisotropic globules occurring in the tissues are no evidence of the presence of oleates or of cholesteryl esters. More probably they consist of a cholesterol-fatty acid or similar mixture.

7. Anisotropic globules and anisotropic myelin forms are closely related and appear to be identical structures under varying conditions differing only in their shape.

8. The formation of these unstable combinations of cholesterol with fatty acids and other substances suggests that cholesterol may play an important part in fat absorption and fat metabolism and in other physiological and pathological processes.

9. It is probable that many structures which have been described as cell inclusions, parasites of different sorts, hæmoconia, etc., find their explanation in myelin forms and such structures should always be examined with reference to this point. Myelin forms assume an endless variety of shapes and often show most vigorous movements closely simulating the movements of living organisms.

10. The view that cholesteryl esters can absorb large quantities of water appears to be erroneous. This property is characteristic rather of the cholesterol-fatty acid combinations.

It will be seen from these conclusions that I differ in many respects from others who have studied these anisotropic globules. Practically all who have studied the question have come to the conclusion that these globules are composed of protagon, oleates or cholesteryl esters. The evidence that these authors bring

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forward as to the existence of esters is very imperfect and in many cases it seems to depend on the fact that they detect the presence of cholesterol and a fatty acid, which they would equally find if the globules consisted of the peculiar mixtures which I have described. When cholesterol and fatty acids exist together in solution it is very difficult to separate them by simple crystallisation, and those who have worked at the subject have separated the constituents by means of caustic potash or sodium ethylate. Some help might be gained by saponification with sodium carbonate which has no effect on the esters while it readily breaks up the more unstable combination.

I must criticise the paper of Adami and Aschoff more fully.

In the first place these authors appear to use the presence of anisotropic globules as a test of the crystalline fluid character of a substance. A substance may, however, show fluid crystals and not anisotropic globules and *vice versa*.

In the next place they state that potassium palmitate and stearate do not show anisotropic globules under any conditions. I find, however, that these salts, like the other potassium salts, assume the crystalline fluid phase at room temperature on the addition of water to the anhydrous crystals and, if they are at all contaminated by some free fatty acid, they exhibit myelin forms and anisotropic globules with water.

Again these authors prepared their cholesteryl esters by heating together cholesterol and a fatty acid. In this method of preparation it is very difficult to obtain the ester in a pure condition and it is probable that the substances they worked with were contaminated with the more unstable compound. Thus I find that cholesteryl palmitate when pure will not give anisotropic globules even if it is made into an emulsion with glycerine or water. If, however, the ester contains a slight excess either of cholesterol or of palmitic acid, it gives myelin forms and globules readily. On the other hand an equimolecular mixture of cholesterol and palmitic acid when melted and allowed to cool exhibits a magnificent display of anisotropic globules and, from the description of their methods it is evident that Adami and Aschoff were working with such a mixture.

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Cholesteryl esters are not formed by heating together cholesterol and a fatty acid in the presence of water.

Adami and Aschoff conclude that fatty acid is to be considered an essential constituent of myelin. My observations on equimolecular mixtures of cholesterol with cetyl alcohol or glycerine show that this statement may have to be reconsidered, and it is possible that some of the globules may be composed of a mixture of cholesterol with some substance which is not a fatty acid.

With regard to choline oleate I have no experience, but there does not seem to be any evidence that such a compound exists in the body.

Adami and Aschoff state that cholesteryl oleate is in a crystalline fluid condition at room temperature. I find, however, that it undergoes complete solidification in 12—18 hours.

I may refer readers to the article by Dr. F. Craven Moore in the present volume. He has been working at the subject from the chemical aspect while I have been studying it from the point of view of the histologist, and it is interesting to note that from these different aspects we have arrived at the same conclusion as to the existence of these cholesterol-fatty acid combinations which are distinct from the esters.

I have to thank Dr. J. F. Thorpe for advice on some of the chemical aspects of this investigation.

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GAS-CONTAINING CYSTS OR AIR-BLADDER TUMOURS.

By W. Mair,
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(From the Pathological Laboratory of the University of Manchester.)

In Andral's 'Treatise on Pathological Anatomy," in the chapter on Diseases of the Alimentary Canal, we find under the heading "Exhalation of Gases," the following statement. "One of the frequent effects of putrefaction is the formation of gases in the substance of the gastro-intestinal parietes. When bodies are opened in summer ever so soon after four and twenty hours after death, the mucous membrane of the stomach and intestines is found puffed up in many places by gases accumulated in the subjacent cellular tissue. This emphysema is not, however, in all cases the result of cadaveric decomposition, but sometimes takes place during life. The case recorded by M. Jules Cloquet is of this description. A scrofulous patient, twenty years of age, died at the *Hôpital St. Louis* in the last degree of marasmus, in consequence of a caries of the vertrebral column. The body was opened shortly after death, before it had begun to show the least sign of putrefaction. There was considerable emphysema of the cellular tissue that unites the different coats of the stomach, so that its parietes appeared to have been inflated, and in several places were near an inch in thickness. The mucous membrane, which was embossed, was pale and free from any appreciable lesion. The two anterior folds of the great omentum, which are attached to the greater curvature of the stomach, were also separated from each other by gas, and the same was the case with the small omentum. There had been no symptom denoting any affection of the stomach, except a complete anorexia for several days before death. Similar gaseous exhalations have been seen in other portions of the submucous cellular tissue, especially in the substance of the parietes of the gall bladder. In laying before the faculty the case just cited, M. Cloquet stated that he had often observed

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the same kind of emphysema in pigs recently slaughtered. In one of these, he found another very remarkable kind of emphysema: to the intestines and mesentery were attached in clusters large bundles of membranous vesicles, which were roundish, transparent, and *filled with air;* they were each appended by a narrow thin vascular stalk. Their size varied from that of a pea to that of a small nut."

I have quoted the above passage in full because it appears to me to draw a very clear distinction between the emphysema which occurs as a result of bacterial action either post-mortem or immediately before death, and a quite different condition, namely, the occurrence of gas-containing cysts described above as "another very remarkable kind of emphysema." In another place Andral refers to the secretion of gases from the blood in the air-bladder of fishes, and it is evident that he regards the gas in these cysts as being of similar origin.

The condition appears to be not uncommon in the pig. Mr. Shattock has kindly called my attention to the fact that there are two examples of it in the Museum of the Royal College of Surgeons (Nos. 293 and 294, Hunterian specimens). One of them (No. 293) is thus described. "A portion of the rectum of a Hog, of which the peritoneal coat is in many places, and especially by the sides of the meso-rectum, covered by groups of thin-walled, transparent, membranous cysts, attached by pedicles, or having broader bases, and containing air." The same specimen is engraved in Hunter's Works where it is described as follows: "A portion of intestine of a hog, the peritoneal coat of which is covered in several places with small pellucid cysts containing air. It was sent to me by my friend Mr. Jenner, surgeon at Berkley, who informed me that this appearance is found very frequently upon the intestines of hogs that are killed in the summer months." Hunter also refers to this specimen in the following passage: "That air is either formed from the blood, or let loose by some action of the vessels, both naturally and from disease, is an undeniable fact. We find air formed in some fishes to answer natural purposes; for in those whose air-bladders do not communicate externally (many of which there

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are) we must suppose it to have been formed there. We also find it in animals after death, and I have a piece of the intestine of a hog which has a number of air-bladders in it. Mr. Cavendish was so kind as to examine this air, and he found 'it contained a little fixed air; and the remainder not at all inflammable, and almost completely phlogisticated.'" A specimen with the history of which the names of Jenner, Cavendish, and Hunter are associated is certainly one of no common interest. "Surely never, on an object so mean to common apprehensions, did such rays of intellectual light converge, as on these to which were addressed the frequent and inquiring observations of Jenner, the keen analysis by Cavendish, and the vast comparison and deep reflection of John Hunter. Surely never were the elements of an inductive process combined in such perfection. Jenner to observe; Cavendish to analyse; Hunter to compare and reflect." Thus eloquently does Sir James Paget express the emotions aroused by a study of the specimens in question. But this is a digression. It will be observed that Hunter, like Andral, regarded these cysts as being quite analogous to the air-bladder of fishes.

Under the name "mesenterial emphysema of hogs," Ostertag describes bunches of small transparent gas-containing cysts attached to the mesentery close to the bowel, or to the bowel itself. There is a good engraving illustrating the condition. A number of authors are mentioned in connection with it but no references are given. It is stated to be found in the carcases of pigs which are normal in every other respect, and to be well known to experienced meat inspectors as a frequent and striking phenomenon.

In man the occurrence of gas-containing cysts within the abdomen is rare. I have only found references to six cases. In four of these the cysts occurred in the wall of some part of the intestine; in the other two they were found in the wall of the urinary bladder. In the vaginal wall the condition is commoner. In 1888, Eisenlohr collected thirty-five cases from the literature of the subject. Although of little pathological importance, these gas-containing cysts are, as Ostertag says, a striking phenomenon, and have given rise to much discussion

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and much ingenious speculation as to their nature and mode of origin.

I have myself had an opportunity of examining two cases. In both of these the gas-containing cysts were removed from the abdomen by surgical operation during life. For the first case I am indebted to Mr. A. B. Mitchell of Belfast. While doing a gastro-enterostomy on a young man who suffered from pyloric obstruction, Mr. Mitchell found the tumour by accident and resected the piece of small intestine involved. The patient made a good recovery in spite of the double operation. The tumour had apparently given rise to no symptoms. Plate I. represents a photograph of the specimen, one-third of the natural size. For the use of this photograph I wish also to express my thanks to Mr. Mitchell.

The specimen comes from about the middle part of the small intestine, about nine inches of the gut having been removed. Of this six inches are involved in the tumour which consists of a lobulated mass of gas-containing cysts surrounding the gut. The individual cysts are very numerous and vary in size from that of a large walnut downwards, the smallest being just visible to the naked eye. The great mass of the tumour is situated at the side of the bowel opposite its mesenteric attachment. With the exception of a few very small cysts close to the gut the mesentery itself is not involved. On the peritoneal aspect the cyst walls are very thin and quite transparent. As already mentioned the mass is lobulated so that the bunches of cysts can be separated from one another to some extent. The cysts are connected together by strands of tissue which from its colour is evidently vascular. A small amount of fluid can be seen in some of the cysts, but the striking feature of the specimen is that the cysts contain gas under sufficient pressure to keep their walls tense. One or two of the larger cysts project slightly into the lumen of the bowel opposite the mesenteric attachment; here the wall is not transparent but is formed of mucous membrane. The cysts do not communicate with one another. When one is punctured it, and it alone, collapses with the escape of an odourless gas. As it was thought possible that the condition might be due to

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bacterial action cultures were made from the interior of some of the cysts on nutrient agar. The tubes after incubation remained sterile.

Before giving the results of the microscopical examination it will be convenient to refer to the second case which I have examined. The specimen in question has been preserved in the collection of the Pathological Laboratory of the University of Manchester. The case has already been published by Mr. Thorburn, and with his permission I have re-examined the histological structure of the tumour. The patient was a woman with pyloric obstruction due to a cicatricial band of fibrous tissue. Full details of the clinical history and operation are given in Mr. Thorburn's paper from which I quote the following description: "During the removal of this band there was now found to the right of the great omentum a collection of rounded cystic masses, extending into the right hypochondrium. The numerous cysts varied in size from that of a small pea to that of a walnut, and were closely packed together in the form of a cone, of which the apex lay some two inches from the middle line, while the base rested near the hepatic flexure of the colon and deeply in the right flank. With much trouble the entire mass was dissected away from the omentum and from the peritoneum of the stomach and transverse colon, to which it was also attached. It then closely resembled a cluster of hydatids, arranged in a cone, with a base about three inches in diameter and having a vertical measurement of some five inches. Each little cyst had a thin transparent but well-defined wall; they were separated only by a delicate fibrous tissue of greater tenuity than the omentum itself. Some of the cysts contained a thin, almost colourless fluid, rather more glutinous than serum, but the majority were filled with an inodourous gas. There was no trace of suppuration anywhere. The excision of this remarkable cone of cysts was followed by the discovery of an almost precisely similar collection upon the left side of the omentum, with its base passing beneath the spleen." This second tumour was not excised.

In this as in the other case the gas-containing cystic masses had nothing to do with the patient's symptoms and were merely

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an accidental discovery. In neither of the cases, unfortunately, was an immediate collection of the gas made for purposes of analysis.

The microscopical examination was carried out similarly in the two cases. After formalin fixation pieces were cut from the tumours, embedded in paraffin, cut in serial sections, and stained in various ways. During the process of embedding it was necessary, in order to secure proper penetration, to puncture as many of the small cysts as possible and gently express the gas.

The histological structure of the tumour in the two cases is almost identical. The smaller cysts are lined by a layer of finely granular protoplasm with nuclei arranged in a single row or irregularly scattered several rows deep (Fig. 3). There is no definite demarcation into separate cells. The thickness of the layer and the number and arrangement of the nuclei vary considerably. Thus we find at places a definite epithelial lining, consisting of a single layer of cells resting directly upon the fibrous stroma with no basement membrane interposed. Even here there is no distinct separation between the different cells. In other places irregular multinucleated masses of protoplasm project into the interior of the cyst. Mitotic figures are fairly frequent in these lining cells and the multinucleated cells often show vacuolation (Fig. 6). Occasionally the cells are found lying free in the interior of the cyst. The walls of the larger cysts are, in places at least, of extreme thinness, consisting, as seen in section, of one or two fibrils with a few nuclei or nucleated spindle cells either on the surface or between the fibrils. At such places the cyst can hardly be said to have a definite epithelial lining. Where the wall is slightly thicker capillary blood-vessels appear in it, and indeed the vascular arrangement in the cyst wall is one of the most striking features in the structure of the tumour. At places there is a great development of thin-walled and wide tortuous vessels in the septa between the cysts, the blood being separated from the interior of the cyst only by the thin walls of the vessel itself and by that of the cyst (Fig. 1). By means of serial sections I have been able to satisfy myself that all these variations in the struc-

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ture of the cyst wall can be found in one and the same cyst. The supporting framework of the tumour consists of connective tissue in which as a rule blood-vessels are well developed. At places the tissue is condensed in the form of distinct nodules (Fig. 2), with well developed fibrils, inconspicuous nuclei, and no blood-vessels. In some of these nodules active proliferation of cells resembling fibrocytes is to be seen and the tissue elements have become separated from one another leaving clear spaces (Fig. 4). A very characteristic appearance in the stroma is the presence of enormous multinucleated cells. These cells often occur in the nodules already mentioned and are sometimes surrounded by clear spaces or by proliferating fibrocytes (Fig. 4). They often show vacuolation and the nuclei resemble those found in the lining of the cysts. Some of these giant cells measure as much as 250 μ in diameter, and nuclei to the number of several hundreds can be counted in a single section (Fig. 5). There can be little doubt that the proliferating "fibrocytes" and giant cells play an important part in the development of the cysts. That the vacuolation of these multinucleated cells is not due to the presence of fat is shown by osmic acid preparations. In Mr. Thorburn's case I have not found the definite fibrous nodules; the stroma generally is of a looser texture resembling œdematous fibrous tissue, and the development of blood-vessels in the septa is not quite so well marked. In Mr. Mitchell's case the giant cells are not so large and are more regular, usually round in shape. With these reservations the above description applies equally to both tumours.

The definite structure of this tumour appears to me to render it very improbable that it is of inflammatory or infective origin. With the exception of the proliferation of fibrocytes and the presence of giant cells there is nothing in the histological appearances to suggest an inflammatory process and these appearances can equally well be explained on other grounds. There is no exudation or emigration of leucocytes nor any accumulation of round cells. The dilated blood-vessels do not show any increase in the number of leucocytes, and their appearance is not due to an inflammatory dilatation of previously existing vessels but to a new formation of vessels of a special

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type. I have examined sections specially stained in various ways and have been unable to detect the presence of bacteria or other parasites. I believe that the tumour is a true neoplasm, the cells of which have the power of secreting gas, and that its development takes place somewhat as follows. The youngest stage is the fibrous nodule (Fig. 2). In this there occurs a proliferation of cells which are indistinguishable histologically from fibrocytes (Fig. 4), but are undoubtedly endowed with very different physiological characters. By division of the nuclei without cell division the large multinucleated masses of protoplasm are formed. In these gas bubbles appear and gas accumulates around them under sufficient pressure to distend the tissues (Fig. 5). Concurrently with the gas-cyst formation proliferation of other cells gives rise to the formation of blood-vessels with the structure and arrangement described above. As the gas accumulates the cyst walls become thinned and the giant cell or cells, flattened out on the interior of the cyst wall, give rise to the incomplete epithelial lining. The thin-walled blood-vessels in the septa between the cysts are obviously for the purpose of securing a secretion of gas from the blood.

The secretion of gas by cells is not unknown in the animal economy. The work of Haldane and Lorrain Smith has shown that the cells of the lungs alveoli take an active part in the exchange of gases. In the air bladder of fishes, which this tumour resembles more than any other normal structure, gases are secreted from the blood. The vascular arrangements especially, in this tumour, resemble those in the air-bladder of fishes.

For a proper understanding of the nature of these tumours it is obviously important to have an accurate knowledge of the composition of the gas contained in them. Unfortunately in this respect our knowledge is not yet very complete. Several analyses have been made by different observers in the case of cysts from pigs and from the human vagina. The modern writers agree that they contain oxygen and nitrogen with very little carbon dioxide. It will be remembered that Cavendish, in his report to Hunter, found a little carbonic acid and for the rest nitrogen. The percentage of oxygen is variously stated at

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from 16 to 20 %. In the case of cysts from the human intestine no quantitative analyses have been made. All that we know about the gas in these cases is that it is odourless and not combustible. The close correspondence of some of the analyses with the composition of atmospheric air makes it questionable if the authors realised the rapidity with which diffusion of gases can take place through such a thin membrane as that composing the cyst walls. There is usually no statement as to the time at which the analysis was made, and it is quite possible that admixture with atmospheric air may have taken place. An accurate analysis of the gas from a sample obtained at the earliest possible moment after removal of the tumour is therefore much to be desired. Obviously the most suitable material for this purpose would be that obtained by surgical operation or, in the case of pigs, at the abbatoir. It may be mentioned here that the gas in the air-bladder of fishes consists chiefly of oxygen and nitrogen, the oxygen being present in considerably greater proportion than in atmospheric air. In the case of fishes from great depths especially, the oxygen often amounts to 80% of the whole, and it must here be secreted against enormous pressure. Bohr has shown there occurs in the air-bladder "a true secretion of a highly oxygenated gas mixture which is so far under nervous control that it fails when the branches of the vagus which supply the air-bladder are cut."

As the view that these gas-containing cysts are true neoplasms, analogous in structure and function to the air-bladder of fishes, is here put forward, so far as I know, for the first time, I must now refer to the literature of the subject, and adduce additional arguments in support of this view, while criticising some of those previously entertained.

The first case of gas-containing cysts of the intestine with a description of the microscopical appearances was published in 1876 by Bang of Copenhagen. I have not seen the original paper, but it is fully quoted by Winands. The condition was found in a woman who died from intestinal obstruction due to volvulus. The wall of the intestine towards the lower end of the ileum was affected for a length of two feet. Cysts varying in size from that of a pea to that of a bean were present in

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large numbers in the coats of the intestine. The peritoneal coat was thickened by a new growth which in small part showed a compact structure but was mostly in the form of thin sheets and strands. The whole of this structure contained an immense number of cysts, the smallest being barely visible to the naked eye while the largest were the size of a pea. All the cysts contained gas and no fluid. Microscopically the cysts in the wall of the intestine were found to lie mostly between the muscle fibres from which they were separated by a layer of fibrillar tissue. Some were situated in the submucosa. The inner surface of the cysts was lined with an endothelium of which most of the cells were very large and multi-nucleated. The cysts in the new growth of the peritoneum had very thin walls of connective tissue with a lining endothelium exactly like those in the wall of the intestine. For the rest, this new growth consisted of a fibrillar connective tissue with a large number of cells of which some were round and small, others oval and larger, and others spindle-shaped and of very considerable size. The tissue was very vascular and some of the vessels were dilated. Dilated lymph channels containing large cells and a net-work of fibrin were also seen. These did not communicate with the cysts. Bang considers that the cysts may have arisen in two possible ways, either by dilatation of pre-existing lymphatic spaces, or secondly, as a true neoplasm. As he found no connection between the lymph spaces and the cysts he thinks that the first suggestion must be rejected. He thus comes near to what I believe to be the true explanation of the condition. The cyst formation begins, according to Bang, with the enlargement of a connective tissue cell to form a giant cell. The tissue space around this cell then becomes filled and distended with *serous fluid,* probably as a result of the vital activity of the cell. The production of gas in the cysts is regarded as a secondary change. As Eisenlohr has pointed out there is absolutely no analogy to be found for this change of serous fluid into gas and no suggestion whatever is given by Bang as to why or how it takes place. He had apparently no microscopical evidence of fluid even in the smallest cysts. One notices here a reluctance to admit the possibility of the secretion

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of gas by the body cells, an idea which presented no difficulties to the earlier writers like Hunter and Andral. In the later literature of the subject the possibility of such a secretion never seems even to have been considered.

As much of the discussion on the aetiology of these gas-containing cysts has arisen in connection with their occurrence in the vagina, it will be convenient here to give a short resumé of what is known as to this condition. It has been described by many writers under various names (Colpohyperplasia cystica, Emphysema vaginæ, etc.). It occurs most frequently, though by no means exclusively, in pregnant women, especially towards the end of pregnancy. The cysts occur in large numbers in the mucous membrane or submucosa and contain gas which escapes with an audible hiss when they are punctured. Occasionally cysts containing fluid occur along with the gas cysts. In one of Schmolling's cases the cysts were observed to contain at first gas, and later serous fluid. The condition usually disappears shortly after parturition.

A bibliography is given by Breisky who regards the condition as not very uncommon. He had himself seen twenty examples of it. Very good coloured engravings of the appearances as seen with the speculum are to be found in a paper by Chénevière. The microscopical appearances have been most fully described by Chiari. In two cases which came under his own observation he found giant cells in the tissue spaces and lining the smaller cysts. The close connection of the cysts with dilated blood vessels was also noted. Chiari also investigated microscopically five specimens of the condition in the Prague museum, and in three of these he found quite similar appearances. He pointed out the striking resemblance of the histological features to those of Bang's case of "intestinal emphysema." Chiari thinks it not improbable that the gas contained in the cysts is atmospheric air which has found its way through minute lesions in the mucous membrane into the lymphatic spaces. Such an explanation of the origin of the gas cannot be seriously regarded as possible. Indeed much of the speculation as to the aetiology of these vaginal cysts is characterised by a profound ignorance or neglect of elementary

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facts of physiology and pathology. As another example of the ingenuity which may be expended in the endeavour to avoid the obvious, I may mention the suggestion of one writer that the gas in the cysts may consist of trimethylamine. If the reader is further interested in the subject he may consult Eisenlohr's paper where there is a full discussion and criticism of all the various theories of this nature.

More worthy of serious consideration is the view, first suggested by Klebs, that these cysts are of infective origin. Klebs found numerous micrococci and bacteria inside the cysts in a specimen in the Prague museum, and Eisenlohr's work, in which the view of the bacterial origin of these cysts is elaborated, was done under Kleb's direction. The material at Eisenlohr's disposal was obtained *post mortem* from two cases. In the first case, that of a woman who died from heart disease, gas-containing cysts were found in the wall of the intestine and also in the vagina. In the second case the cysts were found in the wall of the bladder in a woman who died from cancer of the ovary. The microscopical appearances were the same in both cases and the description corresponds closely with that already given more than once in the present paper. In particular the presence of giant cells and dilated blood-vessels may be mentioned. Eisenlohr also found dilated lymph spaces lined by endothelial and multinucleated cells and he lays great stress on the fact that these communicated with the cysts, and that the neighbouring cysts communicated with one another.

In the lymph spaces and in the cysts Eisenlohr found clumps of bacteria. These were exceedingly small, requiring for their demonstration a magnification of 2500 diameters. Eisenlohr himself admits that with lower powers they might easily be mistaken for albuminous deposits or disintegrating cells, and this I believe to be the true explanation of the appearances which I have also found in my own preparations. In one case only, the bladder case, cultures were made. Here the sectio took place 24 hours after death. From the mucous membrane of the bladder and from the gas cysts a bacillus was isolated which showed motility, did not liquefy gelatine, and produced

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gas in certain media. Its characters are not further described. There is no evidence that this bacillus was the same as those seen in the sections, and there can now-a-days be little doubt that it was in fact *B. Coli* or a related form, and that its occurrence was merely a post mortem phenomenon. We cannot admit, therefore, that Eisenlohr has made out his case for the bacterial origin of these tumours.

Marchiafava has described a case in which serous cysts occurred in the wall of the intestine. This case is of interest here because of the occurrence of multinucleated cells in the tissue spaces and lining the cysts. We have already seen that in some cases cysts containing fluid occur in the vagina along with gas containing cysts.

In the case described by Winands the gas cysts occurred in the wall of the ileum over a length of several feet, and also in that of the large intestine. They were found *post mortem* in the body of a woman who had suffered from chronic gastric ulcer and dilatation of the colon. The lungs showed tuberculosis and a condition of chronic adhesive peritonitis is mentioned. Gas cysts occurred also in the adhesions, and it is not clear whether there was a tuberculous peritonitis, or whether the adhesions mentioned were the result of the cystic new-growth. Higher up in the intestine in this case there was an interesting condition which throws some light on the natural history of these tumours. On the inner aspect of the bowel there were seen pale areas with slightly raised margins suggesting at first sight ulcers. The mucous membrane was, however, continuous over these areas and on further examination they were found to be due to the presence of cysts which had collapsed, fibrous adhesions having taken place between the apposed walls. The microscopical appearances in Winand's case were exactly similar to those previously described. Bacteria were present, but the author regards them as of little importance. He expressly declines to offer an opinion on the aetiology of the condition, but regards Eisenlohr's case for the bacterial origin of the cysts as certainly not proven. Winand attaches much importance to Marchiafava's case referred to above and thinks it probable that in all cases the cysts at first contain fluid.

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In Winand's paper reference is made to an inaugural thesis by Camargo (Geneva, 1891), in which gas cysts were found in the wall of the large intestine of a man who died from pulmonary tuberculosis. Camargo also described a case where the condition occurred in the wall of the bladder. He accepted Eisenlohr's explanation of the condition.

Ostertag, describing the condition in pigs, thinks that it must be infective in origin, and from certain histological appearances which he does not further specify, he is of opinion that it is due to a yeast. All his cultures, however, made from quite fresh specimens, yielded negative results.

If we review the facts summarised in the foregoing we see that quite a considerable number of cases of gas-containing cysts have been described in the human subject which agree in all essential respects both as regards their naked-eye and their microscopical appearances. The condition is commonest in the vagina; the site next in order of frequency is the intestine. There can be little doubt that it is the same condition which occurs more frequently on the intestine and in the mesentery of the pig. The explanation of all these cases must be the same. Apart from the view that the condition is a true neoplasm which is capable of secreting gas, the only intelligible explanation which has been suggested is that it is due to infection by bacteria or other parasites. In this case we must suppose that the giant cells are of inflammatory origin, and that the gas is produced by a fermentative process from the body juices. Apart from the fact that such bacteria or parasites have never been satisfactorily demonstrated it appears to me quite impossible to explain the structure of the tumour on these lines. How, in this case, do the cysts come to be separate from one another and to possess in part at least, a definite protoplasmic lining consisting of multinucleated cells? How are the vascular plexuses in the cyst walls to be explained? If, as appears probable, the contained gas consists chiefly of nitrogen and oxygen this fact would also be strongly against the bacterial theory. The explanation of the fact that certain of the cysts contain serous fluid appears to be simple. It is easy to understand how a serous exudate might take place into a gas-containing cavity

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with absorption of the gas; this sequence of events has actually been observed in vaginal cysts. It is quite another matter to suppose, as certain authors have done, that a serous exudate can be replaced by or converted into gas. For such a process there is no analogy, and apart from bacterial action it would appear to be quite impossible. When in other tumours we find cystic spaces filled with a definite secretion no difficulty is felt in supposing that the secretion is due to the vital activity of the lining cells; thus in tumours of the liver bile may be secreted, and thyroid tumours even in their metastases secrete colloid substance. Why should not tumour cells secrete gas? It may be said that there is no analogy for this process in the mammal. I have already indicated that an analogy may be found in the activity of the lining epithelium of the lung alveoli. But even if we have to go to the fish for an exact analogy, surely this does not render its occurrence as a pathological process in mammals any less probable. Mammals are certainly descended from a fish-like ancestor

It is admitted that the tumour does not correspond closely in its manner of development to that of the air-bladder of fishes, which is formed as a diverticulum from the alimentary canal, but the final result is a structure which, especially in its vascular arrangements, very closely resembles that of the air-bladder. Of its resemblance in function there can be little doubt. In support of the view that there is a true homology between these tumours and the air-bladder of fishes it may be further pointed out that the sites in which the tumours occur are in close relationship developmentally with the alimentary canal.

The mammalian lung is homologous with the air-bladder of fishes, although it has undergone in the course of evolution, a complete reversal of function as regards the direction of the gaseous interchange. If the view of these gas-containing tumours expressed above be correct we might expect to find similar tumours in connection with the lung. So far as I know no case exactly corresponding to them has been described. Sir Thomas Barlow has described a gas-containing cyst in the lung which was completely cut off from all communication with the air passages. I have myself observed in an adult a small

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Plate I.

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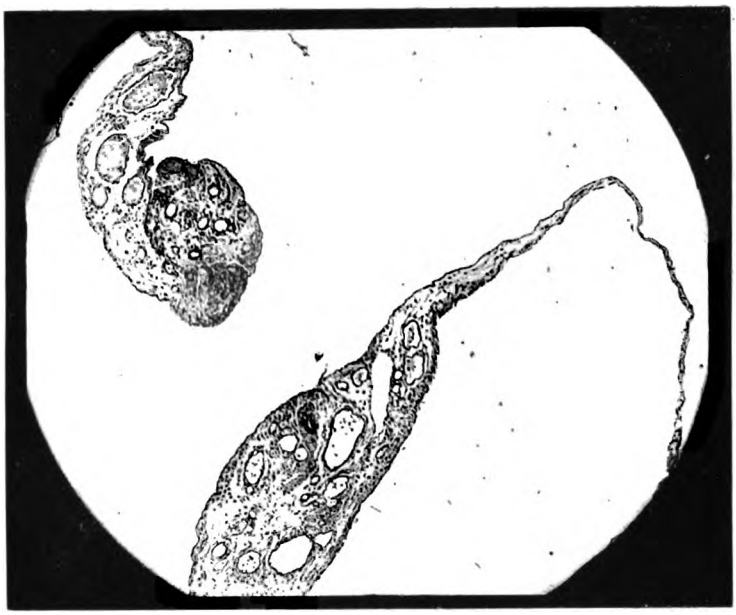

Fig. I.

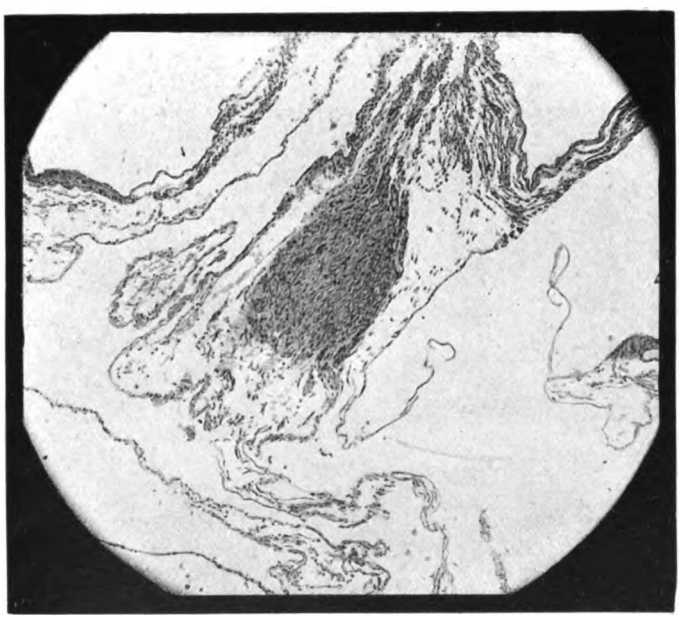

Fig. II.

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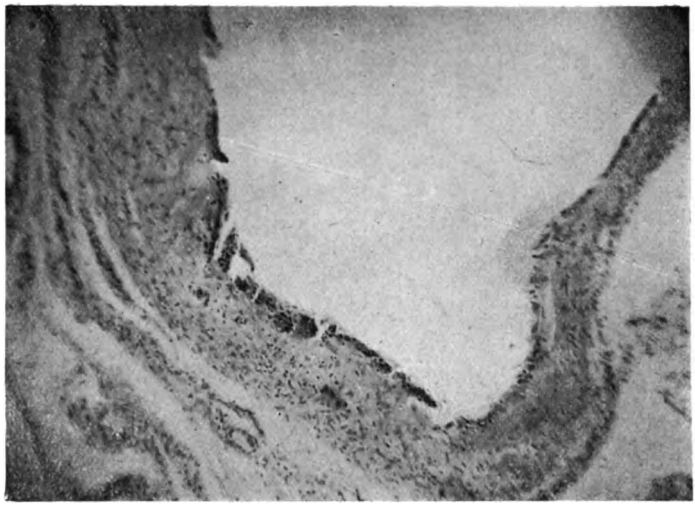

Fig. III.

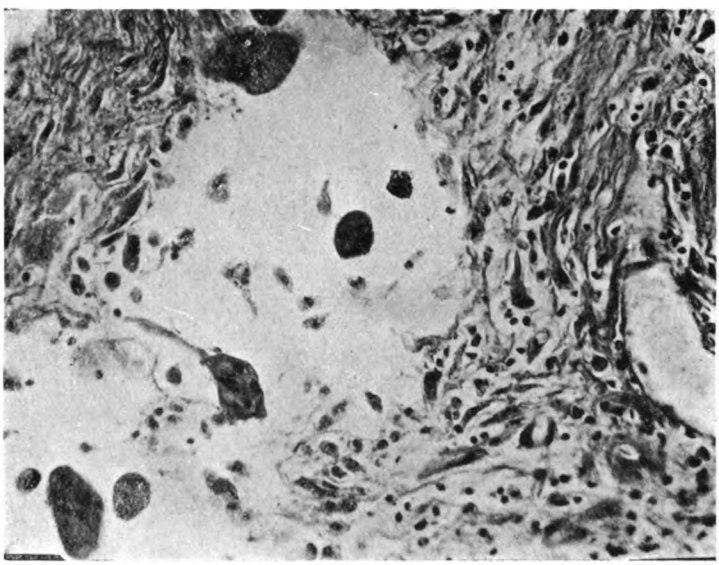

Fig. IV.

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Fig. V.

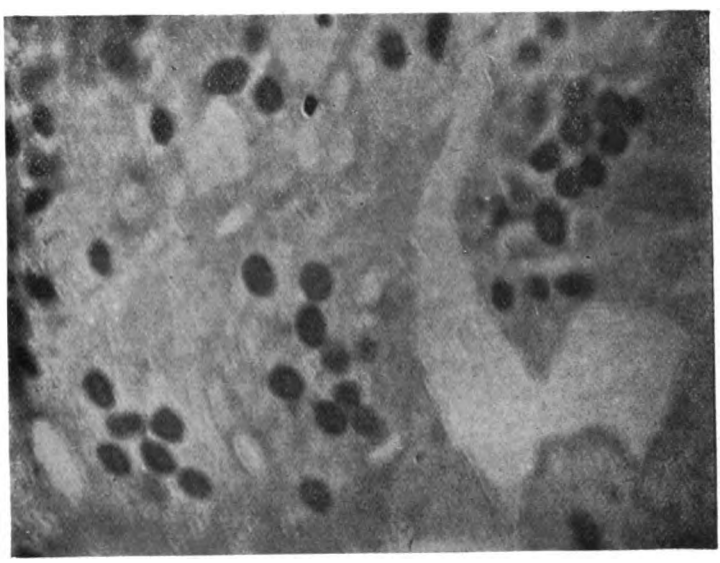

Fig. VI.

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detached piece of lung tissue attached by vascular fibrous tissue to the lower border of the left upper lobe. This isolated portion was pale in colour, in marked contrast to the deeply pigmented lung. Although it had no connection whatever with the air passages it was distended with gas. In both of these cases gas must have been secreted from the blood into the detached portion of lung and they are therefore of considerable interest in the present connection.

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DESCRIPTION OF MICROPHOTOGRAPHS.

PLATE I.

Gas-containing cystic tumour of the small intestine removed by surgical operation. From a photograph; one-third natural size. Mr. Mitchell's case.

Fig. 1. Shows part of the wall of a cyst with large thin-walled blood-vessels; also (top, left) a vascular septum projecting with a free margin into the interior,

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at the free margin is a fibrous nodule in which blood-vessels are developing (×45). Iron Hæmatoxylin and Orange G.

Fig. 2. Shows undifferentiated fibrous nodule and thin cyst walls. (×45). Iron-Hæmatoxylin, Picric acid, Acid Fuchsin.

Fig. 3. Part of a cyst wall showing lining of multinucleated cells. (× 70). Iron-Hæmatoxylin and Orange G.

Fig. 4. From growing part of tumour. Shows multinucleated cells and proliferation of fibrocytes with separation of the tissues due to gas accumulation. At right side a large thin-walled blood-vessel is seen. (×240). Safranin, Picric acid, Indigocarmine.

Fig. 5. Shows a very large multinucleated cell with vacuolation and early cyst formation. (×240). Iron-Hæmatoxylin and Orange G.

Fig. 6. Multinucleated cells from the lining of a cyst showing vacuolation. (× 760). Iron-Hæmatoxylin and Orange G.

NOTE.—Figs. 1, 2, and 4, are from Mr. Mitchell's case; Figs. 3, 5 and 6, from Mr. Thorburn's case.

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ON A CASE OF HÆMOLYMPH GLANDS.

By J. LORRAIN SMITH, M.D.

(From the Pathological Department, University, Manchester.)

THE attention of those who have investigated the subject of hæmolymph glands has been given chiefly to the question how far these structures are to be regarded as organs essentially different from ordinary lymphatic glands. Some authors have been led by their observations to the conclusion that they are entirely distinct while others have argued that they should be regarded as intermediate between the lymph glands and the spleen and that various forms can be found which when arranged in series show a gradual transition from one type of structure to the other.

Hæmolymph glands occur not only in the human body but in a large variety of animals. They are inconspicuous and, as a rule, are the size of a cherry stone and even smaller. They are often embedded in fatty tissue, as, for example, when they occur in the retroperitoneal tissue of the human body, a site in which they have been freqently observed.

The structure is, generally speaking, that of a lymph gland, a large part of which is occupied by blood sinuses. The presence of blood in these sinuses gives to the tissue a characteristic red appearance and to the naked eye they resemble lymph glands, into which hæmorrhage has taken place. When the sinuses are not so prominent a part of the structure the glands have a marbled grey and red appearance.

The microscopic structure has been described in detail in several papers and I will shortly refer to this subject in giving an account of the present case.

The attempt to define the functions of hæmolymph glands has not so far resulted in definite conclusions. On the one hand they have been looked upon as concerned with the destruction of worn out red corpuscles; but the view has also been adopted that they are composed essentially of hæmogenetic tissue and that both red and white corpuscles are produced by them.

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The present case is of interest because of the light which it throws on the nature of one variety of hæmolymph glands in the human subject.

The patient, a woman, aged 25, came to the Infirmary suffering from exophthalmic goitre. The exophthalmos was marked, the action of the heart was very irregular, and there was laboured breathing. She died two days after admission, the only change in her condition being that her temperature had risen to 101·4°F. There was no histological examination of the blood during life.

The summary of the autopsy record is as follows: Thyroid gland moderately enlarged; thymus gland persistent; spleen weighed 13 oz., firm and on the cut surface showing prominent Malpighian bodies; lymphatic glands of the mesentery slightly enlarged and of a pink grey colour. Microscopic examination of them at a later date shewed that they had the structure of ordinary lymph glands but throughout the section were seen large numbers of congested blood-vessels.

The kidneys, the liver, pancreas and intestine were normal; the lungs were normal. There was no disease of the blood-vessels. The heart was dilated and hypertrophied, the myocardium being thickened throughout but especially that of the left ventricle. There was no degeneration in the muscle fibres.

The heart, trachea and larynx with the thyroid gland were removed together in order to retain intact the chain of anterior mediastinal and peri-bronchial lymph glands. These two groups of glands showed the red or marble appearance associated with hæmolymph structure. Many of the glands were markedly increased in size, the largest of them being $1\frac{1}{4}$ in. in length and $\frac{3}{8}$ in. in thickness. The cut surface was red and black in colour, the black being identical in appearance with the pigmentation due to extraneous carbon absorbed from the lungs. In some of the larger glands there were seen on the cut surface circumscribed areas in which the black pigmentation was as abundant as in ordinary glands in this group, while the remainder of the section was red from the presence of blood in the sinuses. After a careful dissection of a few of the individual glands it is apparent that they were supplied by relatively large

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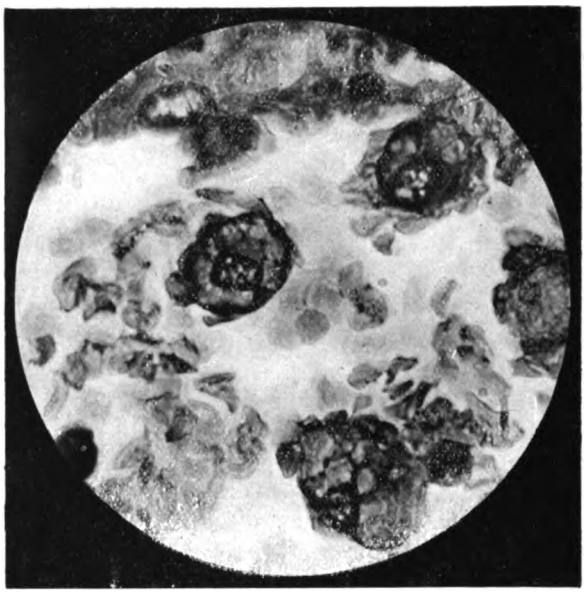

Fig. 3.—Section showing the phagocytes of the lymph sinus; the body of these cells is packed with red blood corpuscles; Zeiss $^{1}/_{12}$ oil immersion.

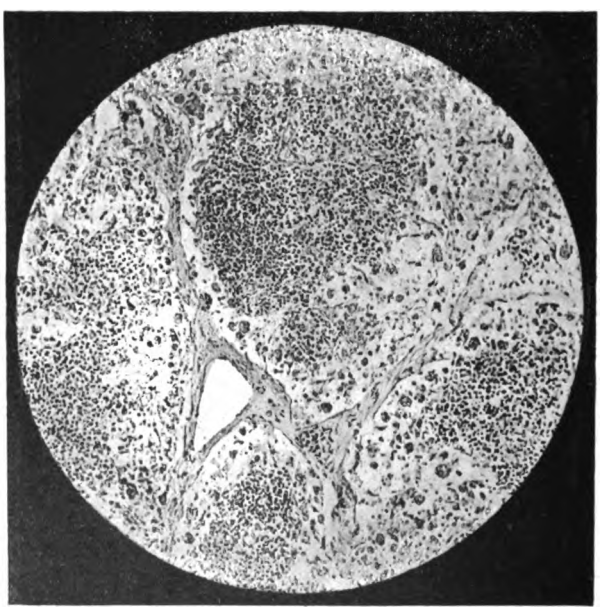

Fig. 4.—Section showing the relation of islands of lymphoid tissue, trabeculæ and peritrabecular lymph sinuses containing blood. The conspicuous cells in the sinuses are the phagocytes of the reticulum.

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Fig. 1.—Section of gland (low power) showing the capsule in which run afferent lymphatic vessels; subcapsular lymph sinus containing blood; trabeculæ passing into the gland from the capsule; peritrabecular sinuses and lymphoid tissue.

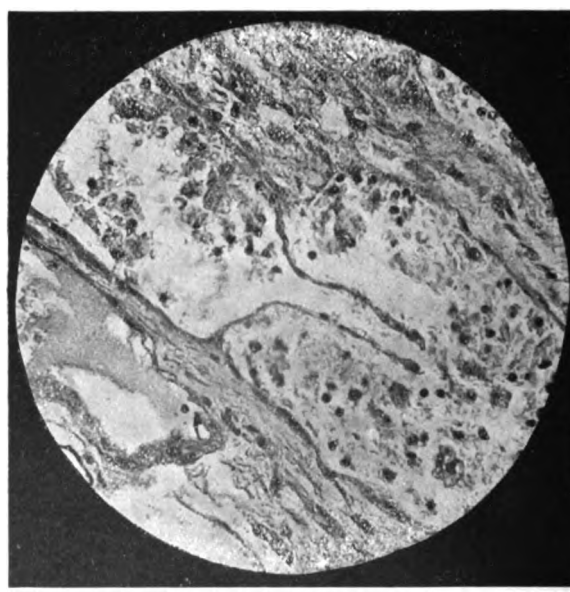

Fig. 2.—Section showing lymphatic vessel in the gland capsule. The valves are seen projecting into the lumen, which contains blood. Amongst the red corpuscles are seen numerous lymphocytes and a few large phagocytes.

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blood-vessels. The veins especially are dilated; but the arterial twigs coming from the internal mammary artery seem also unusually large. The preparation shows also between neighbouring glands the usual inter-communicating lymphatic vessels. In other words these glands have the ordinary anatomical arrangement and also the arterial venous and lymphatic supply of glands in this area.

The microscopic structure of the hæmolymph glands in this case corresponds with that which has been described by various writers. The gland is provided with a capsule consisting partly of fibrous tissue and partly of non-striped muscle fibres. In the capsule on the convex side of the gland may be seen the lymphatic vessels which enter the gland on this aspect (Fig. I.). They can be distinguished by their walls and by the valves (Fig. II.) which are seen projecting into the lumen and pointing towards the gland. These vessels open into the subcapsular sinus and from this communicate directly with the sinuses which are situated alongside the trabeculæ. From the sinus which surrounds the trabeculæ lateral processes extend amongst the lymphoid tissue (Fig. IV.). In all these situations the sinuses are very widely dilated and filled with blood. The blood sinus is separated from the lymphoid tissue by a clearly defined border of endothelial cells but it is impossible to determine whether or not these cells form a continuous membrane. Here and there this border, in place of being a well defined layer of cells, has the appearance of a condensation of the reticulum. Across the sinuses in which the blood is situated there runs a meshwork of fibrous strands on which are situated cells showing comparatively large pale staining nuclei and a moderately abundant protoplasm.

The fibres of the meshwork on which these cells are situated are much thicker than those of an ordinary sinus in a lymph gland. Many of these cells show excessive activity in absorbing into their protoplasm the surrounding red corpuscles (Fig. III.). Occasionally these cells have 2 or 3 nuclei and when the corresponding protoplasm of this plasmodium is packed with red corpuscles the structure forms a very conspicuous globular mass in the field of the microscope. Isolated cells of this type set free

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from their original site but still showing the remains of red corpuscles in their protoplasm may be seen in the vessels and spaces which have been described as occurring in the gland capsule (Fig. I. and II.). These free cells occur in blood which contains a relatively large proportion of lymphocytes (Fig. II.) also and we may therefore argue that the blood in these vessels in the capsule has either come from another gland by an intercommunicating lymphatic vessel or has reached the lymphatic vessel by a reflux from the sinuses of the gland into which these vessels are passing. The presence of the valves renders this latter explanation improbable (Fig. II.). It is impossible to regard these vessels in the capsule as other than the afferent lymph vessels of the gland. They enter the capsule on the convex aspect of the gland and communicate with the subcapsular sinuses exactly like the afferent lymphatic vessels of the typical lymph gland. The disposition of the sinuses in the gland and the reticulum which crosses their lumen is also identical with that of the typical gland. The one point of difference which has been clearly made out is that blood occupies the vessels and sinuses which are normally occupied by lymph and that the red corpuscles are being destroyed by the phagocytic cells of the reticulum. The nature of the afferent lymphatic vessels will become clear from a study of the trabeculæ.

The trabeculæ (Fig. IV.) are composed partly of fibrous tissue and partly of non-striped muscle fibres, a fact which can be readily demonstrated by Van Gieson's method. The trabeculæ are mostly much thicker than those of the lymphatic glands from the mesentery, and remind the observer of the clearly defined trabeculæ which are seen in the spleen.

The well defined blood-vessels which run in the trabeculæ are numerous and widely distended with blood. In addition to these, other vessels or spaces are seen with delicate walls composed of a single layer of flat endothelial cells. The relatively large lumen of these vessels is filled more or less completely with a homogenous coagulum which resembles the hyaline thrombus met with in lymphatic vessels. These spaces show occasionally near their walls a series of lymphocytes and polymorphonuclear neutrophile leucocytes and not infrequently a small portion of the lumen is occupied by red corpuscles.

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Vessels containing this coagulum can be traced to the hilum of the gland. Here we may observe at intervals along the channel delicate valves which open outwards from the gland. There can no doubt that these channels are the efferent lymphatic vessels which normally pass out from the hilum of the gland. That they are not veins is clear because of their structure and contents. That in this case they contain a small amount of blood is due to the presence of blood in the lymph sinuses.

If we group these observations together it is clear that these hæmolymph glands show the minute structure of ordinary lymph glands and it is further to be noted that the lymphatic vessels which appear in the trabeculæ and which gradualy gather into an efferent trunk at the hilum contained lymph which had been to a very large extent freed from the red corpuscles which had found their way into the afferent lymphatics and lymph sinuses. In other words in spite of the apparent change in structure the gland is acting like the ordinary lymph gland in intercepting extraneous particles from the lymph stream. The extraneous matter in this case being the red blood corpuscles.

The sections stained by the Prussian blue method showed surprisingly little evidence of the presence of iron. There was a certain amount of blue staining but much less than one might expect from the amount of phagocytic destruction of red corpuscles which was taking place. Round the nucleus of some of the phagocytes loaded with red corpuscles a blue colour was developed by the application of this method.

The lymphoid tissue consists partly of nodules of small lymphocytes situated in the meshes of a fine reticulum with the characteristic groups of larger endothelial cells in the centre. The remainder of the lymphoid tissue is composed of columns of larger cells with more abundant protoplasm and a round central nucleus which contains relatively less chromatin than the small lymphocytes. The lymphoid tissue as a whole is very vascular and the vessels are markedly congested.

Some of the lymph glands of the mesentery were retained for microscopic examination and for comparison. They showed marked vascularity and congestion. The structure was however that of ordinary lymph glands. The sinuses were free from red

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blood cells, the vessels, lymphatics, as well as arteries and veins, were much less prominent, and the trabeculæ were much more delicate in structure. The reticulum was composed of fine fibres and the cells situated on the mesh work in the sinuses were small, round and quiescent. The one point of essential difference was that in the mediastinal glands blood was present in the afferent lymphatics and lymph sinuses. The lymphoid tissue in the mucous membrane of the intestine showed no abnormality. There was nothing to be noted in the section of lung. In the spleen there was a considerable amount of endothelial proliferation and a diminution of the area of the blood sinuses in the spleen pulp. Even after a careful search no evidence of phagocytosis of the red corpuscles in the blood sinuses could be obtained.

The general conclusion to which the study of this case leads us is that the hæmolymph gland is in one form at least nothing else than an ordinary lymph gland into the sinuses of which blood has found its way. How far this conclusion is valid for other cases it is at present impossible to say. According to the records hæmolymph glands have been observed in man and animals singly or in small groups. So far I have not seen another case described in which a well defined group showed this modification generally.

The interesting question remains regarding the meaning of this modification. Nothing has been made out by the investigation to show how the blood reaches the lymph sinuses. The study of the subject by the injection method seems to be by no means free from fallacy. Drummond remarks that after injection it was impossible to distinguish hæmolymph glands from ordinary glands in his experimental investigation. Further information will no doubt be obtained if the search continues amongst well defined groups of lymph glands for the occasional occurrence of this modification.

Apart from the anatomical question as to the channel by which the blood reaches the lymph sinus this case raises one or two interesting questions for the decision of which further observations are required.

In the first place are we justified in regarding the condition

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of the spleen in which the blood sinuses were partly obliterated by endothelial proliferation, as in any way connected with the intense phagocytic activity of the reticular cells of the lymph sinus in those glands. Dock and Warthin have observed "hyperplasia by hæmolymph nodes" in cases of the splenic fibrosis of Banti's disease (*Amer. Journ. of Med. Sci.*, 1904). Warthin had previous to the investigation just quoted come to the conclusion that the hæmolymph glands are compensatory structures assuming the function either of the spleen or the bone marrow. The possible connection of the condition with the disease from which this patient suffered should also be kept in view in further investigations.

For an account of the investigation of this subject especially from a comparative point of view with full references to the literature the reader is referred to the recent paper by Weidenreich, *Archiv für Mickros. Anat.*, 1905.

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A NOTE ON COLOURLESS FÆCES WITHOUT JAUNDICE.

By J. Dixon Mann,

For several specimens which serve to illustrate this contribution I am indebted to my friend the late Dr. Dreschfeld, who took great interest in the subject. Others were sent to me by Dr. Mumford. Most of the observations were made on hospital patients under my care, whose diet could be strictly regulated.

The brown colour of normal fæces is attributed to the presence of urobilin into which the bile-pigment is converted in the intestinal canal; the kind of food also influences their colour. The designation "colourless" fæces is comprehensive: it includes various tints from white to pale grey (sometimes with a faint suspicion of yellow), and those indefinitely tinted stools described as clay-coloured. Occasionally, pale stools quickly acquire a glistening sheen due to a large excess of neutral fat, some of which rapidly congeals on the surface of the fæces after evacuation. When this is associated with a pale, neutral-tinted stool, the motion has a singularly metallic, bronze-like appearance. When the flow of bile is completely obstructed, as in total blockage of the common duct, the fæces are devoid of natural pigment and, if the diet of the patient is restricted to milk, they will be quite colourless. It is to be observed, in severe jaundice, that a mere trace of bile may find its way into the bowel without the urobilin it furnishes being sufficient perceptibly to colour the motion, especially as such motions usually contain a large amount of fat which obscures any slight coloration that is present. When absolute blockage of the common duct occurs, it is probable that small amounts of absorbed urobilin may be excreted through the walls of the intestinal canal. Cases of stoppage of the bile with concurrent jaundice, however, are distinct from those under consideration which are limited to cases that are free from jaundice and from any obstruction to the flow of bile into the duodenum.

The reduction of bilirubin into urobilin is due to bacterial

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action; it takes place in the cæcum and in the upper part of the large intestine; exceptionally, it may take place in the lower part of the small intestine, and is then probably pathological. When urobilin is formed in the small intestine, it is absorbed with great activity and consequently appears in excessive amount in the urine. The reduction of bilirubin may be carried beyond the stage of urobilin-formation, and then a colourless body—urobilinogen—the chromogen of urobilin, is formed. In this way, although a normal amount of transformed bile-pigment may be present in the fæces, they may be devoid of colour. Urobilinogen is readily oxidised by sunlight and air, and is thus converted into urobilin. If colourless fæces which contain urobilinogen are exposed to the air, they develop colour which in time becomes brown. The specimens of fæces which were examined were voided in the dark and were at once enclosed in well-corked earthenware vessels in order to avoid premature conversion of urobilinogen into urobilin.

A specimen, which was slightly tinted stone-colour, had a feebly acid reaction, and darkened on exposure to air. An alcoholic extract gave a negative reaction for bilirubin. It showed a feeble urobilin-spectrum and a faint fluorescence with zinc acetate. A few drops of tincture of iodine were added to some of the extract which was then allowed to stand for a short time. On re-examination, the urobilin band was found to be much denser, and the fluorescence more intense. The inference is that the fæces contained a small amount of urobilin along with a considerable amount of its chromogen which accounted for the darkening on exposure to air, and for the increase of urobilin when the urobilinogen in the alcoholic extract was oxidised by the addition of iodine. Another specimen from the same patient, obtained two months later, had much the same colour, but it was alkaline in reaction; it also darkened on exposure. An alkaline extract contained neither bilirubin nor urobilin. The darkening on exposure pointed to the presence of urobilinogen which was identified by means of Ehrlich's para-dimethylamidobenzaldehyde test. This reagent does not react with urobilin, but it reacts with urobilinogen, and also with indol and skatol, so that it is necessary to free the

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fæces from these bodies before using it as a test for urobilinogen. A portion of the fæces was repeatedly extracted with petroleum-ether, after the method of Otto Naubauer, by which the indol and skatol are removed, along with some of the fat; the extraction (which is a tedious process) was continued until the petroleum ceased to react with the benzaldehyde. An alcoholic extract of the fæces after they had been thus dealt with gave a brilliant red colour with Ehrlich's test, which yielded the characteristic absorption band close to the right of the D line. On oxidation, the extract gave the reactions of urobilin.

Formerly, the presence of great excess of fat was supposed to account for the occurrence of colourless fæces without jaundice; in some instances, excess of fatty matter undoubtedly has a considerable influence in this respect, but it is rarely the sole factor. One of the specimens placed at my disposal by Dr. Dreschfeld illustrates this. It had a very pale *café au lait* colour; it was of creamy consistency and had an alkaline reaction. On rubbing some of the fæces in a mortar with petroleum-ether, they at once darkened considerably, and the petroleum became opaquely white, like milk. These fæces contained a less than normal amount of urobilin which was obscured by excess of fat.

A specimen from a hospital patient showed a condition which is occasionally, but not often met with. The patient suffered from stricture of the lower bowel for which she subsequently underwent an operation. At the time she was chiefly on milk diet. Nothing noteworthy was observed about the fæces until my attention was called to an evacuation which was white; it had a sour odour like strong cream cheese, and a freely acid reaction. There was no jaundice, nor was the urine darkened in colour. On exposing a layer of the fæces on the water bath, they slowly acquired a very pale buff-tint, which did not deepen after prolonged exposure to air. An alcoholic extract contained neither bilirubin nor urobilin. After being exhausted with petroleum-ether, the fæces gave no reaction with Ehrlich's benzaldehyde test, nor with Schmidt's sublimate test. The acidity was chiefly due to butyric acid. Microscopical examination showed abundance of neutral fat, with clumps of soaps and

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clots of casein. Here, it is probable that no bile-pigment had reached the intestine whilst this motion was in progress, and yet there was no jaundice. Although the urine was not bile-stained, an extract obtained from a considerable quantity yielded evidence of a trace of bile-pigment, but no urobilin was present. On the following day the motion was moderately dark in colour, and it contained both bilirubin and urobilin. In this case it appears probable that the flow of bile was abruptly and completely arrested for several hours, and then as abruptly restored. The patient had no pain as of gallstone, nor was any stone found in the subsequent motions, nor at the operation. It is interesting to note that on the sudden reappearance of the bile, some of the bilirubin passed along the bowel unchanged.

The assumption of a temporary stoppage of the bile, however, does not account for all the cases of colourless fæces which do not darken on exposure. Instances occur in which the condition persists for many consecutive days without the least trace of jaundice. Cases of this description are difficult of explanation on the lines at present accepted relating to the pigment of normal fæces. I have long felt convinced that the presence or absence of urobilin does not account for all the variations in fæcal coloration, and am disposed to believe that other unrecognised pigments (apart from the colouring matter of food) contribute towards it. A still more heterodox opinion has recently been expressed by Steensma (*Ned. Tydschr. v. Geneesk.*, 1907) who believes that there is no urobilin to speak of in normal fæces immediately after they are voided, only urobilinogen. He holds that the colour of normal fæces does not depend upon urobilin; as alcoholic extracts of acholic, and of normal fæces, show no appreciable difference in colour.

The pathological conditions in which colourless fæces without jaundice may occur, comprise defective supply of bile to the duodenum, intestinal catarrh, tuberculous abdominal disease, malignant disease of the intestine, septic diseases (especially those which affect the abdomen), chlorosis, and leukæmia.

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CASE OF (?) TUBERCULAR INTRA-OCULAR GROWTH.

By A. Hill Griffith, M.D.,

Ophthalmic Surgeon, Royal Infirmary; Surgeon, Royal Eye Hospital; Lecturer on Clinical Ophthalmology, Victoria University of Manchester.

The case came under my charge some nine years ago at the Royal Eye Hospital, and as I have never before or since seen any case quite similar I am taking this opportunity of recording it.

Elizabeth J., aged 22, single, farm servant, was first seen by me as an out-patient on June 22nd, 1898. The right eye was quite blind, the pupil reacted through the other eye only, the tension was normal and there was no redness or other changes to be seen. She had a blow on the eye some months before and the (?) sight failed since.

The sight of the other eye has also quite lately failed somewhat, the vision is $^{6}/_{12}$, the disc rather pale, chalky in appearance, and "filled in," the vessels are rather small. The chart of the visual field shows a large defect at the nasal side.

Her father died of heart disease; her mother, aged 60, is alive and healthy, one brother aged 32 is well, one sister aged 27 is also healthy, one other sister died from fits the sequence of a severe blow on the head.

Patient has had severe frontal pain for last few weeks, and also complains of staggering at times, especially on rising up. She had rheumatic fever when a small girl, but no rheumatism since. Her occupation necessitates long hours and hard manual labour making cheeses, etc. There is some glandular swelling on the right side of neck.

Dr. R. T. Williamson kindly examined her and found the lungs, heart, etc., all normal.

She was admitted as an in-patient and remained in the Hospital three weeks, during which time the eye and general

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condition were repeatedly examined by myself and others, but nothing further was made out.

The ophthalmoscopic appearances of the growth in the right eye are well depicted in the accompanying drawing which has been very successfully done by Dr. W. E. Fothergill.

The disc and a large area in the centre of the fundus is occupied by a rounded mass like a dense fleecy thunder-cloud, over which can be traced the retinal vessels.

The outer half forms a sharply defined steep rounded swelling, extending well forward into the vitreous. This portion is slightly translucent and its surface is thickly covered by round shining refractive bodies somewhat resembling drops of oil or fat. These little white tufts scattered over the growth can be seen in places against the sky line as it were and the appearances reminded one of a bare hill with a flock of sheep on it.

The inner half of the growth is not nearly so prominent, steep or sharply defined, but gradually shades off to the level of the choroid. This portion is nearly free from the above mentioned white tufted bodies but shows a few hæmorrhages.

The treatment consisted in the administration of cod liver oil and creosote.

The patient was 12 months later re-admitted as an indoor patient and remained under observation for four weeks.

The appearances of the growth were practically unchanged, but the vitreous, which before was noted as clear, showed a few fine filamentary opacities. Eye externally quite normal and tension of globe was normal. The sight of the left eye was now quite normal.

The patient says that the sight of the bad eye has been failing for five years, and I think this is much more likely to be correct than her former statement.

Tumors in the fundus are not common and practically speaking are of three different kinds: glioma of the retina, sarcoma of the choroid and tubercular masses. One must also mention adenoma, angioma, fibro-chondroma, metastatic carcinoma, and some other even rarer growths.

In dealing with our case one can exclude glioma from the

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age of the patient. Carcinoma is always secondary and for this and other reasons can be also definitely put aside. The appearances are totally different from any other case of sarcoma I have ever seen and I have seen a good many.

At the December, 1891, Meeting of the Ophthalmological Society, Johnson Taylor showed a patient with " A growth of a doubtful nature," the features of which somewhat resembled our case, but there were no globular bodies. There had been marked impairment of vision for eleven years.

The eyeball having been removed some eighteen months later, the growth proved to be a spindle-celled choroidal sarcoma somewhat cavernous in structure.

It is possible that our case may, like the above, be some anomalous form of sarcoma.

On the whole I am inclined to regard it as tubercular but I am by no means certain, and as I cannot trace the patient the diagnosis must remain unsettled.

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CHRONIC JOINT DISEASE OF STILL'S TYPE.

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IT has been recognised for many years that occasionally children suffer from chronic disease of the joints resembling, more or less closely, rheumatoid arthritis of the adult and such cases have been grouped indiscriminately together as cases of rheumatoid arthritis. Still in 1896 read a paper[1] before the Royal Medical and Chirurgical Society of London, in which he showed that several distinct joint affections had been described as belonging to this group and he emphasised the importance of further differentiation. He suggested that there were at least three quite distinct joint affections included in this group. One of these is extremely rare and is not allied to rheumatoid arthritis of the adult in any way. Its etiology and pathology are probably identical with those of acute rheumatism. There is no evidence of bony change and the deformities that are met with are due to the invasion of neighbouring tendon sheaths by a process of fibrosis originating in the structures surrounding the joints. Other rheumatic manifestations, such as heart disease or subcutaneous nodules, may be present and Still suggested that the term "chronic fibrous rheumatism" was the best one to apply to this condition. The second class of case met with, very closely resembles rheumatoid arthritis of the adult and clinically at any rate it appeared to be identical with that disease. It comes on after the second dentition, is polyarticular and the usual deformities and osteophytes occur, as in rheumatoid arthritis of the adult. To this form of chronic joint disease in children the term "rheumatoid arthritis" should be restricted. Much more frequent that either of these two varieties, is a form of chronic disease, possessing distinctive characters, that entitle it to be recognised as a clinical entity, and since we are indebted to Still for the differentiation of this important group of cases, it is convenient to apply to them the term "Still's disease," at any rate temporarily, until the pathogenesis of the disease is

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more clearly defined. Several cases of Still's disease have been described since 1896 but the disease seems sufficiently rare to justify the publication of the details of even an isolated case. A clinician of such wide experience as the late Dr. Dreschfeld had only seen one example of the disease, and a melancholy interest will always be attached in my mind to the case I am now reporting, in that the last conversation I had with my old teacher, a day or two previous to his death, was in reference to this case and he showed all that enthusiastic interest that made association with him so stimulating and helpful to others, and promised to see my patient on his next visit to the Hospital.

Still's disease may be defined as a chronic progressive enlargement of the joints, associated with enlargement of lymphatic glands, and usually of the spleen. The essential characters of the disease will be readily understood from the details given below.

Edith J., aged 11 years, was admitted to the Manchester Royal Infirmary, under my care, on June 17th, 1907, complaining of inability to walk on account of stiffness of the knees and ankles. The onset of the disease dated back two years, when the right knee gradually became swollen, no complaint being made of pain. About the same time the right ankle also swelled, and the patient limped in the right leg, walking on her toes. Six months later, the left knee and ankle became affected with swelling, pain again being absent. In August, 1906, she was admitted to the Children's Hospital, Pendlebury, under Mr. C. Roberts, to whom I am indebted for the notes of her condition at that time. The right knee was held in a flexed position, and there was very little movement. There was no tenderness. The knee was swollen and fluctuation was obtained on the inner side. The right ankle was also swollen and rigid. The left knee and ankle were similarly affected, but to a less extent. The left hip was flexed and slightly abducted, and there was marked lordosis. The joints of the upper extremity were unaffected. Walking was impossible owing to the stiffness of the knees and ankles; on three occasions the joints were moved under an anæsthetic, with the result that, by means of crutches, walking was possible for a time, but patient very

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rapidly relapsed into her former condition. The forcible movement of the joints was sometimes followed by effusion. She continued under observation at Pendlebury Hospital till November, the only feature of interest being the occasional occurence of night cries. Soon after her return home, both wrists began to be affected, swelling and limitation of movement developing, without pain or redness.

Previous Medical History. Patient suffered from measles and mumps in infancy, from scarlet fever in 1902, and from chicken-pox in 1903. These diseases apparently ran a mild course without complications. Apart from the acute specific fevers, patient had a clean bill of health, and attended school regularly till the age of nine years.

Family History. No history of tuberculosis or rheumatism.

Condition on Admission. She is a bright, intelligent girl. The face is pale, but not wasted. The right pupil is considerably smaller than the left, but her mother tells us that such has always been the case. There is slight but distinct hemiatrophy of the face on the left side. The trunk is well-developed and well-nourished. Patient is completely bedridden, due to the fixation of the joints of the lower extremity.

Knee Joints. Both knees are swollen. The affection is markedly symmetrical. The legs are flexed at right angles on the thighs, and movement is slight on the left side and almost imperceptible on the right. There is no pain or tenderness of the knees, except on attempts at movement. The swelling seems chiefly confined to the soft structures, and examination by the X-rays show no bony changes. The ankylosis is evidently due to contraction of fibrous and tendinous structures around the joints. There are no signs of free fluid. One of the most striking features of the condition is the marked muscular wasting of the thighs and legs. The tendons of the hamstring muscles stand out under the skin as taut bands.

Ankle Joints. Affected similarly to knees.

Wrist Joints. The left wrist is more affected than the right. The dorsal and palmar aspects of the carpus are markedly swollen, obliterating all normal depressions. The swelling is soft and pulpy, and closely resembles the " white swelling " of

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a tuberculous joint. Movement is restricted, but still possible; there is some tendinous creaking on movement. X-rays show no bony changes.

Hands. The metacarpo-phalangeal joint of the right thumb is affected, and the similar joint of the left index finger.

Elbows. Not much affected. There is some restriction of supination and pronation on the left side, and the arm and forearm muscles are considerably wasted.

Hips. Right hip apparently free. Left hip shows partial ankylosis with limited external rotation. There is no lordosis, however.

Other Joints. Apparently unaffected. Spinal column shows no signs of disease.

Lymphatic Glands. The cervical glands, especially those in the posterior triangle, are enlarged on both sides but more markedly on the left. The axillary, supratrochlear and inguinal glands are also enlarged. The glands are separate, rather hard, not tender and vary in size from a pea to a hazelnut.

Spleen. Not palpable and no apparent increase, as determined by percussion.

Tonsils. Not enlarged.

Heart. No evidence of valvular disease or of adherent pericardium.

Lungs. No signs of tuberculosis or pleurisy.

Temperature. Periods of apyrexia, alternating with short periods of pyrexia, but evening temperature never greater than 100°.

Blood. Moderate amount of anæmia. Hæmoglobin decreased to 80 per cent; red cells normal, white cells decreased, with relative lymphocytosis.

Urine. Apparently normal.

Course of the Disease. During the six months patient remained under my observation, very little change occurred. The right elbow gradually became affected and it was interesting to note the entire absence of pain, redness and effusion and the insidious onset of stiffness and swelling, apparently due to extra-articular fibrous changes.

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Treatment. The advisability of surgical procedures was considered, but Mr. Wright, who kindly gave me his valuable opinion on the case, agreed that it was better not to run the risk of stirring up active mischief by forcible manipulations under an anæsthetic. General tonic treatment was instituted with good effect on the general condition of the patient. Locally massage was employed and extension by weights was successful in correcting some of the deformity due to flexion of the knees but our patient was still unable to walk when she left hospital. Dr. Loveday kindly made a series of observations as to the opsonic index of the blood to the tubercle bacillus and injections of tuberculin were employed and Bier's treatment by passive congestion was tried, at Dr. Loveday's suggestion, the method being used at those times when the opsonic index was high. The opsonic index determinations will be referred to at more length when the discussion of the nature of the disease is considered. It will be sufficient to state here that the local improvement under these measures was extremely slight and our patient left the hospital with her general health improved but the local joint condition not distinctly ameliorated.

Diagnosis. There seems no doubt that the condition was an example of the polyarthritis, originally described by Still. The age of onset was a little later than in Still's cases [2] where, out of twelve cases, ten began before the second dentition. Enlargement of the spleen is not always noted; it was found by Still in nine out of twelve cases. Parkes Weber [3] describes a case very similar to the present one commencing in a girl at twelve and a half years.

Nature of the Disease.

The clinical appearances and pathological findings alike negative the idea that Still's disease is related to osteo-arthritis. Fibrillation of the cartilage, osteophytic change, and exposure and eburnation of bone were all absent in the three autopsies recorded by Still.[2] This author thinks the pathology of the disease uncertain, but that some of the symptoms are at least suggestive of a microbic origin. Parkes Weber [4] has described a case of Still's disease where an attack, of what was apparently endocarditis, occurred, and since pericardial adhesions

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have been found in other cases, he was inclined to believe that the affection was more allied to articular rheumatism than to any forms of osteo-arthritis met with in adults. Poynton and Paine attempted to obtain microbic cultivations from the joints of Parkes Weber's case, but the attempt failed. In the discussion which followed the reading of Parkes Weber's paper before the Medical Society, Sansom was of opinion that the arthritis was not one of rheumatic origin, and he thought there was no definite evidence of endocarditis; and Cautley, Rolleston and Morison were also of opinion that rheumatism could not be regarded as the cause of Still's disease. Poynton, however, quoted two cases observed by him which seemed to point to a rheumatic origin. Parkes Weber in a later paper [5] referred again to the case mentioned above, which he had kept under observation, and was still of opinion that the original affection had been, or at all events had been complicated with, a form of true rheumatism.

Most authorities are, however, distinctly against this view of the rheumatic origin of Still's disease, and Parkes Weber, in a still later paper,[3] inclines to the view that tuberculosis is concerned in its production, most probably by the absorption of toxins formed by tubercle bacilli developing elsewhere. The arthritic manifestations of tuberculosis have received considerable attention at the hands of French observers. Poncet,[6] in an article on "Tuberculous Rheumatism or Pseudo-rheumatism of Bacillary Origin," gives several instances of adults suffering from tuberculosis of the lungs complicated by chronic disease of the joints, resembling, from the description given, in some cases osteoarthritis, in other cases the lesions occurring in Still's disease, and in one instance inoculations showed the presence of tubercle bacilli. In a later paper [7] he describes a case of "senile morbus coxæ," which he believed to be due to "tuberculinisation," that is, poisoning by the tubercular virus rather than infection by the bacillus. He quotes the experiments of D'Or and Courmant, who succeeded in producing serous fungating arthritis with no bony changes by the intravenous injection of attenuated tubercle bacilli. Mouriquand [8] relates a case of "infantile tuberculous rheumatism," which apparently corre-

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sponds to Still's type of polyarthritis, and is of opinion that the symmetrical nature points to a toxin secreted at some distance by the tubercle bacillus. Mailland,[9] in a paper on "Primitive Tuberculous Rheumatism," is of opinion that what looks like a rheumatic arthopathy may be due to tuberculosis, and is not necessarily progressive, but may disappear with the appearance of typical tubercular lesions elsewhere in the body. In other cases a progressive, plastic, ankylosing arthritis may result. Patel [10] thinks that tuberculous rheumatism is much commoner in children than in adults. Johannessen [11] reports a case of chronic joint disease commencing in a girl at the age of four years, symmetrically involving the feet, knees, elbows and hands, where later pulmonary tuberculosis developed. There is, therefore, abundant evidence to prove that a chronic disease of the joints, apparently similar to that occurring in Still's disease, may arise in the course of tuberculosis. Further evidence in favour of the tubercular nature of Still's disease is furnished by the results of tuberculin injections. Parkes Weber [3] found that tuberculin caused a positive reaction generally, but no local reaction, and was inclined from this evidence to believe that the joint condition was not due to direct invasion by the bacilli. Edsall,[12] however, found that tuberculin injections reacted positively each time, but joint pains accompanied the general reaction. I thought it would be of interest in the case I had under observation, to have the opsonic index to the tubercle bacillus estimated, and the reactions to tuberculin inoculations considered, in the light of A. E. Wright's recent work. I had the advantage of Dr. Loveday's skilled help in this, and I am indebted to him for the following report:—

"The patient's opsonic index was determined with the view of the possibility of the condition being tuberculous. The tubercular opsonic index was ·66 which, although not an absolute proof of a tubercular infection being present, is strongly suggestive when the excellent general condition of the patient is borne in mind. Inoculations of $^1/_{2000}$ m.g. tuberculin were given on June 28th, 1907, July 8th, 1907, and on August 9th, on her return from the Convalescent Hospital at Cheadle. In every case a decided reaction followed. Thinking that smaller

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doses could be used, she received in succession three doses of $^1/_{4000}$ m.g. and in each case again the reaction was positive. The doses given were calculated on the assumption that 1 c.c. T.R. contains 10 m. gms. tubercle powder.

The indices were as follows:—

June 27.— ·26.
July 8.—(10 days after $\frac{1}{2000}$ mg. inoculated) 1·12.
„ 11.— ·75.
„ 18.—1·16.
„ 22.—(4 days after $\frac{1}{2000}$ mg. inoculated) 2·51.
Aug. 8.— ·85.
„ 15.—(4 days after $\frac{1}{2000}$ mg. inoculated) 1·00.
„ 19.—1·35.
„ 29.—1·39.
Sept. 5.— ·87.
„ 9.—(3 days after $\frac{1}{4000}$ mg. inoculated) 1·41.
„ 16.—1·00.
„ 23.— ·92.
„ 26.—(2 days after $\frac{1}{4000}$ mg. inoculated) 1·16.
Oct. 14.— ·79.

G. E. Loveday."

These observations clearly point to tuberculosis having an important part in the production of the joint changes found in Still's disease. The question as to whether the changes are due to direct invasion of the joints by the tubercle bacillus or due to the action of a toxin produced by the tubercle bacilli settled in some other nidus, is more difficult to decide. The observations of the French observers quoted above, seem to me, however, to be strongly in favour of the view that tubercle bacilli are actually present in the joints. The low tubercle opsonic index observed when my patient first came under observation points, moreover, rather to some local tubercular infection than to a general toxæmia, which one would expect to raise the opsonic index. It is possible, of course, that we have to deal with a mixed infection since the joint lesions are not unlike those met with in cases of "absorption arthritis." There was no evidence in my case of any source of septic infection but in

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any other examples of this disease that may come under my observation, I shall certainly have the opsonic index to the commoner septic micro-organisms determined.

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E. N. CUNLIFFE.

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BLOOD PLATES.

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This short paper is merely a preliminary note on some observations on blood platelets which I have been carrying out in the clinical laboratory of the Manchester Royal Infirmary and in the private pathological laboratory of Prof. Lorrain Smith, in the University of Manchester, for the past two years. The work is still very incomplete, for apparently the appearance of platelets in blood may have very wide physiological and pathological bearings. Very much work has been previously done on the same subject, but I do not propose to review this here. I will simply give a short account of my own line of observation.

Normal Blood.

Technique. In carrying out the following observations a regular and definite mode of procedure was always adopted. A finger or ear was pricked without any previous cleansing precautions more than washing with soap and water, and the slide, previously cleaned with chromic acid and alcohol and dried, gently touched on the surface of the drop of blood which exuded from the puncture. A cigarette paper was used for smearing. This was dipped into the blood on the slide, so that the blood diffused across the whole breadth of the paper; the paper was then allowed to fall on the line of blood so that it was slightly gripped and required a small amount of force to pull it along and make the smear. This method gives very good uniformly distributed smears without any special collection of white cells at any part of the smear. It has its objections, I know, but it also has its advantages, and to these are due in great part the results of my experiments. The slide was then allowed to dry in the air. When ready it was rapidly flooded with 5 or 7 drops of

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Leishman's stain and then allowed to stand so for 15—30 seconds, according to the thickness of the film. Twice the bulk of filtered water or a soft tap water, like Manchester water, was then added to the stain on the slide, and the dilute stain allowed to act for five minutes. The slide was then well rinsed with the same water, and allowed to stand moist for one minute, roughly dried with filter paper, and then waved gently over a small bunsen flame until all traces of moisture had disappeared. The preparation was now ready for examination with an oil immersion lens, but I always preferred to mount in Canada balsam and cover with a thin glass slip, care being taken to get the very edge of the original seat of the blood drop under the cover-slip, as it is at this region that the platelets are most prevalent.

I have used no other chemical reagents in these observations than what are contained in Leishman's stain, soft (Manchester) tap water and very occasionally distilled water. A few of the slides were warmed to temperatures hotter than that of the body before the drop of blood was transferred to them, but most of them were warmed to body heat, or used at the temperature of the room worked in. The cigarette paper seems to me to do less injury to the blood elements, especially after they have stood 20—30 seconds, than does a glass slide when such be used for making the smear. Thus, the latter procedure breaks up the red corpuscles very readily, forming more or less homogeneous masses of confluent red cells, whilst a cigarette paper does little apparent injury to them; a glass side also appears to injure the platelets and to remove an important part of their substance from them.

Situation of the blood plates. The blood plates always appear in most profusion on that part of the slide on which the drop of blood is put before the smear is made. This effect is more intensified if, instead of just touching the drop of blood on the finger with the slide, the slide be moved whilst touching the drop of blood so that a streak of blood about one-quarter to half-an-inch long is transferred to it. Very few platelets, comparatively speaking, are to be found in the rest of the smear. When the smear is made most successfully the cigarette paper wipes away the bulk of the red cells from the original seat of the

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drop or streak of blood, so that to the naked eye this first portion of the smear is devoid of red cells, and looks apparently as if no blood were left there. When the slide is, however, examined after staining, in this apparently clear part of the smear blood plates in great profusion are found, with a few red and white cells scattered about. (See Fig. 1, low power Zeiss A.)

Conditions affecting the formation of blood plates. The number of platelets which appears on a slide made in the above way increases with the length of time, within certain limits, which elapses between the contact of the drop of blood with the slide and the making of the smear. Thus there are more platelets after 10 seconds than after immediate smearing, more again after 20 seconds, and most after 30 seconds interval between the parts of the process of making a blood smear. The platelets appear better still if in addition to the above conditions the slide has been warmed to about body heat before the blood is transferred from the seat of puncture to the glass. This may be on account of the heat fixing the platelet so that it stands the further manipulations better. If the slide be made hotter still, but bearable against the cheek, the platelets form more rapidly. If the slide be made hot as in the last case, and the cigarette paper or the glass smearing slide be drawn through the drop of blood and then smeared on the hot slide, the platelets are distributed better in the body of the smear, and do not collect at the first portion of it.

If the blood be allowed to stand more than 30 seconds on the cold or warm slide before the smear is made the platelets are inclined to alter in characteristics and to be not so well formed.

If the blood be allowed to stand 60 seconds it is difficult to smear, and no good platelets are to be seen. In such a slide, if the red cells be gently washed off with a stream of water and the slide dried gently over a flame, and the then residue treated with Leishman's stain, a network of fibrin with multipolar bodies at the intersection and continuous with the fibrin are seen. The multipolar bodies are not like the blood plates, and there are none of the latter to be found. This suggests that the platelets play some part in the formation of the network of fibrin which is such an important feature in the coagulation of blood.

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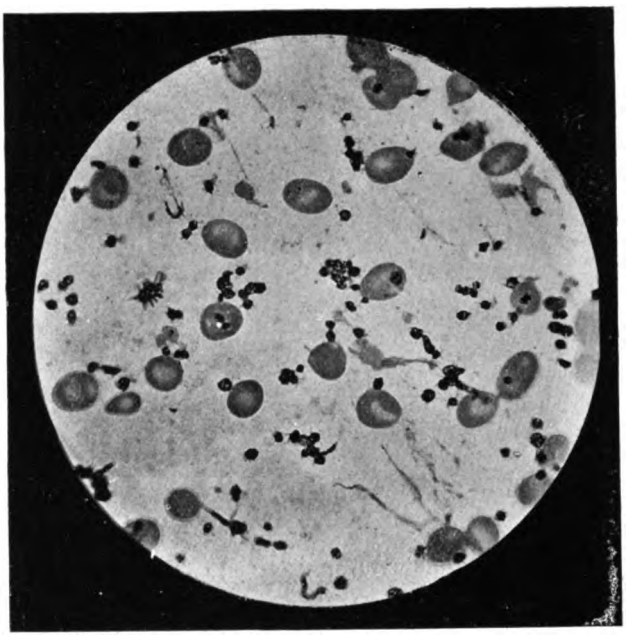

Fig. V.
Pernicious anæmia (?). Red cells and platelets.

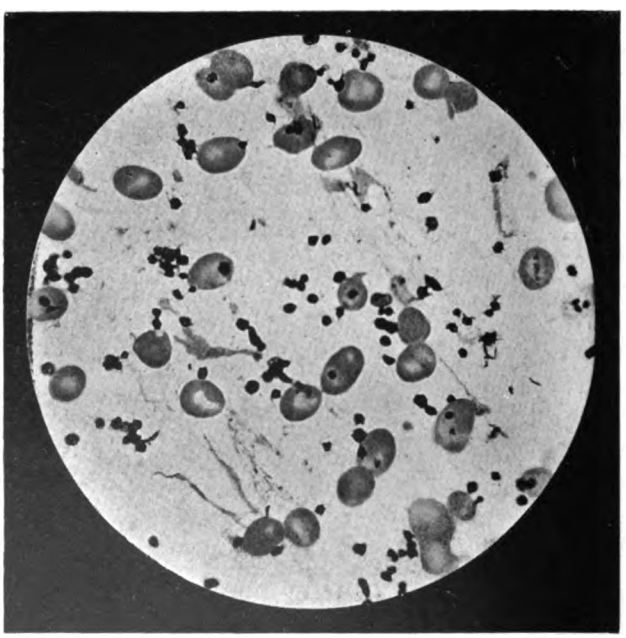

Fig. VI.
Pernicious anæmia (?). Red cells and platelets.

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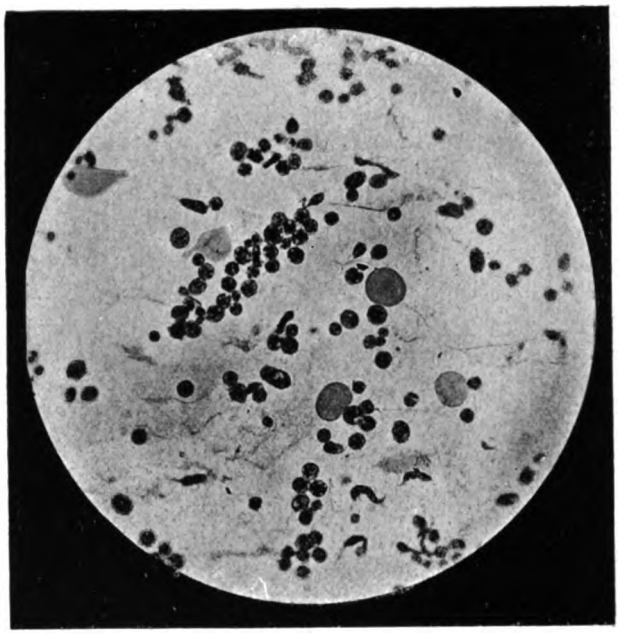

Fig. III.
Normal blood. Red cells and platelets.

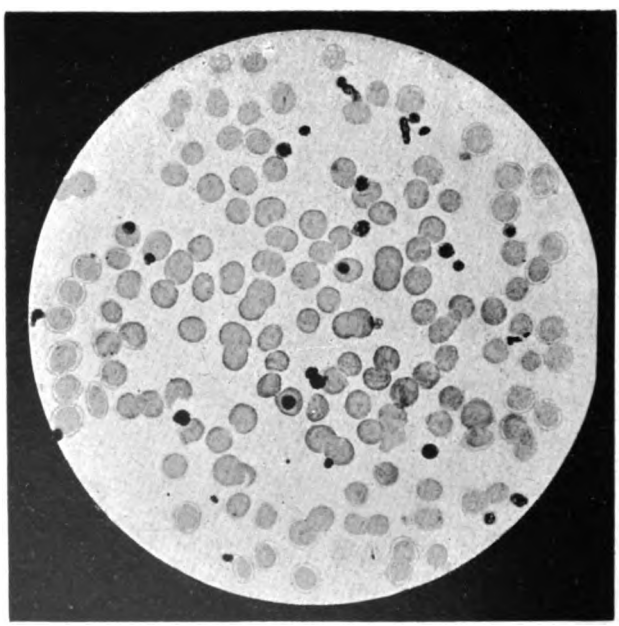

Fig. IV.
Normal blood. Platelets in, or being extruded from red cells.

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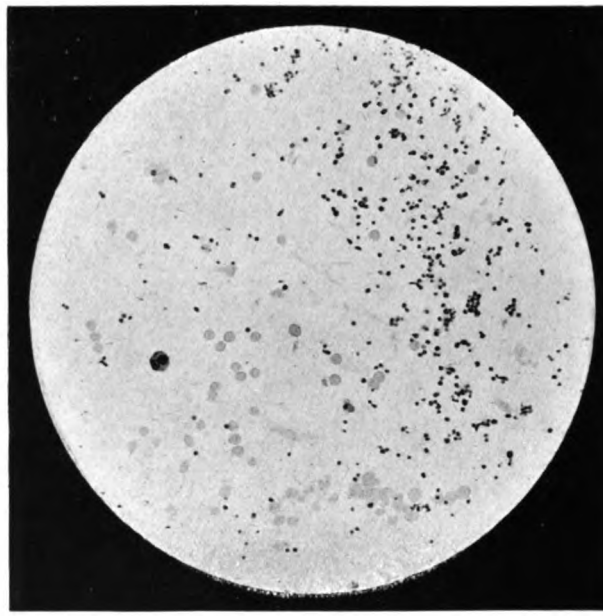

Fig. I.
Normal blood. Blood plates. Zeiss A.

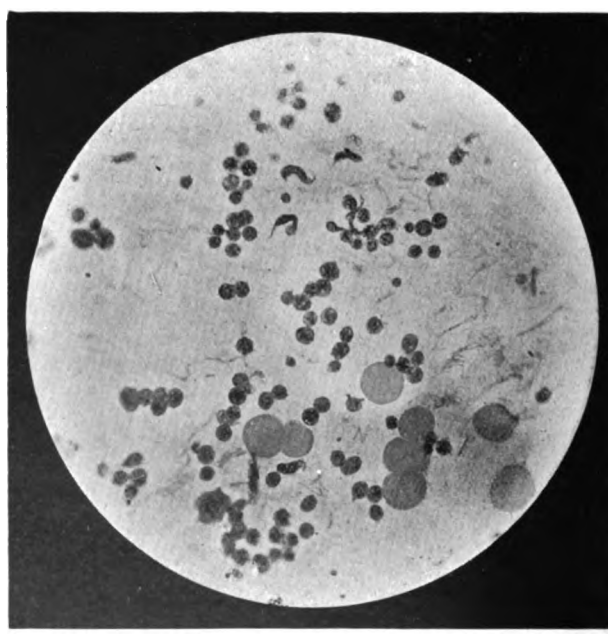

Fig. II.
Normal blood. Red cells and platelets.

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Characteristics of the Platelets.

The characters of the well-formed platelets seen in these slides are very distinct. They appear as *discrete,* cellular-looking structures, about half the size of a red cell (Figs. 1—4), with as a rule distinct circular outline. Occasionally they are more oval, and in some instances tailed and flagellate, and very suggestive of trypanosomes to the uninitiated. They consist of (1) a clear structureless hyaline body which either does not stain at all, or else which takes a faint bluish tint; (2) chromatin granules often aggregated into one or two nucleus-like bodies, of irregular outline and without the distinct limitations of the nucleus of a red or white cell, which take a mixed eosin and blue stain of varying depth of colour; (3) vacuoles, in the middle of chromatin masses. These may be vacuoles or only collections of the hyaline substance of the platelet.

In smears made on a warmer slide the platelets appear as above, and often in profusion in that part of the smear where the blood was originally in contact with the slide before the smear was made. In some of my slides they form a streak across the film which is quite visible under the A lens of a Zeiss microscope (Fig. 1).

The platelets have great adhering power in contact with glass, perhaps even better than that of red corpuscles, for they alone are often seen in that first part of the smear where they are best found, the red and white cells occupying the adjoining parts of the slide. In addition to the large numbers of platelets which are seen on the slide, careful observation will reveal the presence of several red cells with what, to a superficial glance is a weakly-stained nucleus in their substance (Figs. 4, 5 and 6). In some instances two smaller chromatin masses may be seen in a red cell. These structures are very important, for they are red cells containing blood plates, fixed and stained just as the latter are being extruded from the red cells, which, I hope to prove, give rise to all the bodies which I am describing as blood plates.

Staining Characteristics of the Platelets.

Leishman's stain. The red cells take the eosin, the white cells and their nuclei the blue, but the chromatin of the platelets

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takes a distinct lilac-purple shade when stained for five minutes, and a deeper purple when stained for a longer time. The contrast of the staining of the platelets with that of the red cells is very marked when one of the former is stained in the red cell. The body of the completely formed platelet may take a faintly bluish tinge, and the depth of the chromatin stain depends on the degree of aggregation of the granules and the length of time occupied by staining. As I have already stated, the chromatin may appear as dark, nucleus-like masses of a deeper purple colour, the less densely packed granules being a lighter shade. When the platelets are collected in large confluent masses of their chromatin constituent the appearance is that of collections of purple-staining material of irregular outline and shape.

That a platelet in a cell body is not a nucleated red cell is very definite. The platelet does not take the intense blue stain of a true nucleus, it is not so compact in structure, nor has it the mitotic-like appearance which the nuclei of many red cells show.

Ehrlich's acid hæmatoxylin and eosin. When a smear is fixed with acetone-free methyl alcohol or by heat, as by passing through the flame of a bunsen-burner and then stained, the platelets do not take the stain well, their structure not being differentiated clearly, but forming a dull, indistinct body. This fact shows that they are not of the material which forms the nuclei of red cells.

Origin of the blood plates. (1) Do they exist preformed in the blood? (2) Do they arise from the red cells, (3) from the white cells, (4) or from the plasma? The evidence which I have obtained points, I submit, conclusively to the red cell origin of the platelets, and therefore I will refer to it in the first instance.

In slides made as I have described platelets are to be seen in more or less numbers either lying outside and on the proximal surface of a red cell, where it has arrived by a coincidence, or else lying within the cell and on the point of being, or having just been, extruded from it. I have no doubt that the latter condition is what really exists, and for the following reasons:—

1. It is quite common, as many previous observers have stated, to see in normal blood a small cluster of three, four or half a dozen platelets lying together in the mouth of a gaping,

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burst red cell. Their appearance is unmistakable, and, in my opinion, is so obvious as to admit of no doubt that the platelets are the extruded contents of the burst red cell. Such platelets have not the cellular structure of those which are more complete in form. They are without the clear ground substance, and consist of chromatin only.

2. Careful focussing, with an oil immersion $^1/_{12}$ Zeiss lens, of the platelet on or in a red cell points to the " inside " theory.

(*a*) The platelet is not out of focus when the red cell is in focus.

(*b*) The whole contour of the platelet is not distinct, its periphery being indefinite.

(*c*) That portion of the red cell which immediately adjoins the platelet takes the eosin stain less markedly than the rest of the cell, and suggests such thinning of the stroma as could be accounted for by the platelet and red cell being fixed just as the former is bursting through the latter and displacing the eosin-staining tissue of the red cell.

(*d*) Not uncommonly a platelet is seen apparently partly extruded from part of the periphery of a red cell.

(*e*) Not uncommonly a platelet is seen deeper in the red cell, taking the stain much more lightly than when nearer the surface.

(*f*) In those smears which are made on a hot slide, there are more platelets in or on the red cells than in those made on a slide at the temperature of the atmosphere—I suggest because the greater heat has fixed the red cell quickly and caught the platelet escaping. When the blood is on a cold slide the platelet has time to get out before the forces which cause its extrusion cease to act with the death of the red cell.

(*g*) In some diseases, notably the case from which two of my figures is taken (pernicious anæmia), very many red cells show the chromatin mass in their substance.

(*h*) In some instances the extruded platelet may be completely outside the red cell when it will focus differently to the red cell.

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Actual fragmentation of a red cell gives quite a different appearance. Such a condition is seen best if a smear be made on rather a hot slide (about 110°F.). When a smear is made on a slide at the temperature of the room the force which makes the smear distorts the red corpuscles, which are highly elastic bodies, but there is plenty of time after the cessation of the smearing force for the red cell to regain its disc-like shape. When, however, the slide is hot the smear is made quickly, and there is no time for the distorted red cell to regain its original shape before it is killed. In such a slide the red cells are seen as streaks about twice the length of the diameter of an ordinary red cell and about as wide as a red cell when seen on end. Small pieces of red cells, apparently pulled off in the process of making the smear, and looking like microcytes, are also plentiful, and these all stain like the red cells, and have no resemblance whatsoever to a blood plate.

All this positive evidence tends to exclude the possibility of the platelet being formed from fragmentation of a white cell or from extrusion of any of the contents of a white cell. Moreover, I have never seen anything to suggest that this does occur. It also tends to prove that the platelets do not develop from the plasma. Again, I have seen nothing that bears out this suggestion. It also tends to prove that the platelets do not exist preformed in the blood. As further evidence against this theory is the fact that the platelets appear in very much greater numbers in blood which has been allowed to stand 30 seconds before smearing than they do when the smear is made as soon as possible after the blood touches the slide.

What determines the formation of Blood Platelets?

This may be one of several causes—(1) contact of the blood with a puncturing instrument; (2) with the skin at the seat of puncture, or (3) with the glass of the slide; (4) the change of temperature incident to the passage of the blood from the capillaries into the air of the laboratory; (5) or to the action of the gases of the air.

(1) *Puncturing instrument.* That this is not the cause of the formation of the platelets is proved by the fact that more platelets

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form the longer the drop of blood has been allowed to stand, within the before-mentioned limits of time, in contact with the slide. At the same time, there is no denying the possibility that the original entrance of the instrument into the capillaries may, either by the rupture of some blood elements or by some other action, have released some ferment or substance which has the power of inducing the further formation of platelets in the drop of blood on the slide. But I have no evidence to offer in support of this possibility.

(2) *Contact with the finger.* The natural secretions or excretions of the skin or dirt on the finger might be the determining cause, but

(*a*) Cleansing with ether, alcohol, soap and water before the puncture, makes no difference in the number of platelets which are formed as compared with the results of puncturing a finger which has been merely washed with soap and water.

(*b*) If a smear be made within a second or two of the puncture, or after the blood has remained 10—20 seconds on the finger, the number of platelets formed under the conditions described originally is the same whether the finger has been made aseptic, or only washed with soap and water.

(3) *Contact with the glass of the slide* probably has some influence on the formation of the blood plates. This is suggested by the large numbers which are to be seen on that part of the slide on which the drop of blood rests before it is smeared.

(4) The *change of temperature* may have something to do with the formation of the platelets, but my observations with a slide warmed to the body heat suggest that the cold of the atmosphere rather tends to a slow formation of the blood plates.

(5) *Contact with the gases of the air,* apart from the temperature, probably has some action on the extrusion of the plates from the red cells. But the process goes on when the atmosphere is practically prevented from acting on the blood cells. Thus if two closely applied square cover-slips be placed over the seat of puncture, one corner dipping actually into the puncture, and blood be allowed to diffuse up between them

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through capillary action, the platelets still form. Here, however, there is probably some air in contact with the blood, even if it be but a slight amount.

Is the material from which Blood Plates are formed in every Red Cell or only in some?

My observations suggest that only a certain number of red cells contain the material because the number of platelets formed in a slide does not seem to be equivalent to that of the red cells present. This is, however, a difficult point, and one which is now engaging my attention.

Why are the platelets seen only, or in such profusion, on that part of the slide where the droplet of blood has stood before smearing? Does it mean that whilst the blood has been standing there more red cells have settled down and come in contact with the glass and have met with those physical conditions which bring about their formation? Against this view is the fact that if a smear be made at once so that nearly all the red cells in the drop of blood come in contact with the glass and air whilst alive there are comparatively few platelets to be found on the slide. I have kept a smear made in this way moist for 10 or 20 seconds so as to allow time for formation of blood plates, but without any definite result. Again, with such large numbers of red cells as are contained in a drop of blood it is conceivable that all of the red cells could not come into relation with those physical conditions which determine the extrusion of the blood plate, but the evidence just afforded above is also against this conception.

What happens to a Red Cell after it has given rise to a Blood Plate?

As far as its staining characteristics go the cell is apparently none the worse for its loss of the substance which forms the platelet. Cells with a platelet just appearing take the eosin stain as well as ever, and those which have burst in parting with their platelet material are as well stained as any other red cell in the field.

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Do Platelets contain Hæmoglobin?

No; because if a smear be treated with distilled water before fixing to remove the hæmoglobin, whilst the red cells will not take their acid stain afterwards, the platelets take their mixed stain as usual. Such an observation is best carried out by making a smear, letting it dry and then passing it slowly through a bunsen flame to partially fix it. When this is gently treated with distilled water the red cells disappear to the naked eye. If the slide be gently dried, then stained with Leishman's stain in the ordinary way and examined, the red cells are found to be colourless, but the platelets have stained very well. The half fixing of the smear makes it stand the distilled water without losing its cells.

Are the Bodies which I describe Artefacts?

Certainly not, if by the word artefact is meant something manufactured by the art of the observer. They are made in the natural order of events by certain physical forces acting on the red blood cells which cause the extrusion of materials composing the platelet. In my observations no chemicals, such as are contained in Deetjen's, Wlassow's or other fluids were used, my whole endeavour having been to preserve intact the delicate structures which are derived from the red cells when the latter come into association with these physical forces which determine the formation of the blood plates. The use of a cigarette paper brings less force into play in making a smear than does the employment of a glass slide for making the smear, and results, I believe, in leaving more of the delicate material which forms the body framework of the platelet than a glass slide does. The fact is that platelets are found to be better formed after the use of the cigarette paper than after the use of the more rigid glass.

I have seen nothing to suggest that the platelets are formed by the rolling into spherical masses of materials from the plasma of the blood.

A blood plate, then, is formed by the escape of the normal component parts of a red blood corpuscle, and the method of their extrusion, and their appearance when extruded appear to

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me to suggest that they form the central core of a red corpuscle and are surrounded by an outer covering which consists of a stroma containing the hæmoglobin of the corpuscle. Whether the material for their formation exists in certain red corpuscles only or in all is not evident at present.

Appearances in various Diseases.

Chlorosis. In slides made as I have described blood plates appear in extraordinary numbers, and many are to be seen in the parent red cell.

Pernicious Anæmia forms a marked contrast to chlorosis, blood plates being remarkably few or absent altogether in most cases. In one case of apparently typical pernicious anæmia, however, I found many platelets by working with hot slides (see Figs. 5 and 6).

In one case of Splenic Anæmia—probably Banti's disease—which I had under my care, blood plates were practically absent.

Lymphatic Leucocythæmia. In one case which I examined the plates were very scanty.

Platelets occur in large numbers in most secondary anæmias, in spleno-medullary leucocythæmia, acute and chronic Bright's disease, and many other conditions.

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PATHOGENIC PROPERTIES OF AND AMOUNT OF DIRT CONTAINED IN THE MILK SUPPLIED TO THE TOWN OF MANCHESTER DURING THE TEN YEARS 1897 TO 1906 INCLUSIVE.

By SHERIDAN DELÉPINE, M.B., C.M., M.Sc., *Director of the Public Health Laboratory, and Professor of Comparative Pathology and Bacteriology, Victoria University of Manchester.*

IN the course of the past 15 years I have utilised the samples of milk which were sent to my laboratory for the purpose of determining whether they contained tubercle bacilli, to investigate as accurately as possible the relation between the state of the milk supplied to towns and the production of disease. Since 1895, some 7,120 samples of cows' milk have been examined bacteriologically in my Laboratory, by myself and Dr. F. J. H. Coutts, Dr. E. J. Sidebotham or Dr. A. Sellers, according to the methods which I adopted at the beginning, and which have been adhered to up to the present day.

Systematic records have been kept since 1896 of the reaction, amount of sediment separable by centrifugalisation, and of the kinds of extraneous products, cells, and bacteria composing the sediment. Two guinea pigs have in each case* been inoculated, each with the whole of the sediment obtained from 40 cc. of milk. The effects of the inoculation have been carefully noted both in the case of animals dying spontaneously and of those that were killed after a period of several weeks. In many cases the lesions observed post mortem were clearly connected with the inoculation, in a few cases the lesions were accidental.†

In all cases where lesions were found at the seat of inocula-

* Except in a very few cases where only one guinea pig was used.

† All the accidental or doubtful results have been eliminated from the laboratory statistics.

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tion and in the lymphatics connected with the seat of inoculation, or when both animals died about the same time, and exhibited general and local lesions of the same kind, the diseased state was attributed to the milk. I need not say that I have taken the utmost care to secure sterilization of all the apparatus used in connection with the inoculations, and that I have repeatedly tested the efficiency of the methods adopted.

These records constitute a body of scientific evidence based on a very large number of experiments made in the course of over 13 years.

In analysing these data for the purpose above stated, I have found very clear evidence that a great improvement has taken place in the Manchester milk supply in the course of the last 11 years.

During the 10 years 1897 to 1906 inclusive, 4,596 samples of milk have been sent to my laboratory by the Public Health Department of Manchester. Of these, 3,650 have been collected either at railway stations or at places away from the farms. These samples therefore represent the *milk which has during these 10 years been supplied to the Manchester consumers.* They were all samples of what I call mixed milk, and not samples of milk obtained from single cows, or small groups of cows examined at the farms.

Among these samples of mixed milk there were samples taken for the purpose of controlling the efficiency of previous inspection. The number of these samples varied from year to year, and these variations may affect slightly the percentage of tuberculous milk. These variations are, however, not material. On the other hand, it is obviously advantageous to take into consideration all the milk that was put upon the market.

If all these samples of mixed milk are classified according to the lesions which they produced in guinea pigs inoculated with them, it is found that in the years 1897 and 1898* not less than 45 per cent. of these samples produced some kind of lesion, while in 1906 only 14·4 per cent. were noxious to the same extent.

* No mixed milk samples were taken in 1899.

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If instead of grouping all the lesions together one takes only tuberculosis in account, the change is not less striking, for in 1897–1898 the number of tuberculous samples was 17·2 per cent., while in 1906 it had fallen to 6·6 per cent.

The same improvement is shown with regard to severe septicæmic lesions causing the death of one or both animals in less than three days. In 1897–8, 3·6 per cent. of the guinea pigs suffered from such lesions, but *since 1902 no case of this kind has occurred.*

I have prepared a table and diagram showing the results yearly, and it will be noticed that between the years 1897 and 1902 a rapid improvement had taken place. This improvement was followed during the years 1902 and 1903 by a slight relapse. This relapse is attributable to several causes. One of these causes is possibly the effects which the statements made by Professor Koch at the Congress of Hygiene in 1901 had on farmers and agriculturists. I noticed that soon after that Congress many persons interested in the dairy industry expressed contempt for the measures which were taken against tuberculosis in cattle, and some assumed a very defiant attitude. Another possible cause may have been the inclusion of new districts in the field of inspection work. This is the most probable explanation. Whatever was the cause of that short relapse, it was followed by a period of continuous improvement, which has now lasted four years. But even in 1903—*i.e.*, at the time when there appeared to be an arrest in the progress—the number of tuberculous samples reaching Manchester had already been reduced to two-thirds of what it was in 1897–8, whilst in 1906 it had fallen to nearly one-third of the original number. *Not only has the number of tuberculous samples diminished, but the lesions produced by them in inoculated animals have become slight when compared with those observed at the beginning of this inquiry.* This fact shows that the lesions of the tuberculous udders producing tuberculous milk at the present time are much slighter than those which were prevalent 10 years ago.

The work of inspection has had another and a wider effect which can be estimated by comparing the amount of dirt and other abnormal products than can be separated from milk.

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The sediment separated by centrifugalisation consists of:—

1. *Cells* derived from the internal and external parts of healthy and diseased udders (*e.g.*, catarrhal products, pus and blood), and from the hands of the milkers.

2. *Hairs* derived from the skin.

3. *Wool and cotton* from clothing, strainers, and other fabrics.

4. *Vegetable debris* and mineral matter derived (*a*) from food, dung, litter, dirt clinging to the skin of the cow or the hands of the milker; also (*b*) from the water used for cleaning cans and other vessels. The water is also the source of the algæ which are sometimes present in the sediment.

5. *Animalcules,* such as infusoria, worms, insects, and arachnides coming from the food, litter, water used to clean vessels, and possibly from the hands and clothing of dirty milkers.

6. *Pathogenic and saprophytic bacteria, yeasts, and moulds* from various sources.

It is therefore reasonable to expect that the amount and character of the sediments (commonly called slime) which are separable from samples of milk will vary according to the state of the cow-sheds and dairies, and that when the cows, cow-sheds, milkers, dairies, dairy-vessels, and water used for cleaning and other purposes are clean, the amount of sediment is smaller than when reverse conditions exist.

I have therefore paid special attention to the amount of sediment obtainable from all the samples which have been submitted to me, in the hope that this might yield useful results.

The appended Table II. gives only the gross results of this investigation. The amount of dirt, etc., has been estimated by measuring the diameter of the sediment deposited in tubes of uniform diameter, containing each 40 cc. of milk, and left for a quarter of an hour in a centrifugal machine running at the rate of about 2,500 revolutions per minute. The absolute amount of sediment is not indicated by these measurements, but I have

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estimated approximately the relation between the diameter and the weight of these sediments.* A diameter of :—

6–8 m.m.	corresponds to about	7 to 14	grains of dense moist slime	per	gallon.
9–10	,,	,,	20 to 42	,,	,,
13	,,	,,	40 to 84	,,	,,
15	,,	,,	80 to 175	,,	,,
16	,,	,,	130 to 260	,,	,,

To control these results, I weighed the slime separated from 15 gallons of average milk such as reaches the town. This material was kindly supplied to me by Mr. Hailwood in 1900. I found that the amount of moist slime separated from 15 gallons of milk was in this case 304·45 grains, *i.e.*, about 20 grains per gallon. This amount corresponds, therefore, to 9 to 10 m.m. of my scale. During that year more than half of all the samples of milk collected in Manchester yielded sediments from 9 m.m. to 20 m.m. in diameter. From this it will be seen that the lower estimates of the weights of sediments corresponding to various diameters may be taken as giving approximately the amount of dirt and cellular constituents entering in the composition of these sediments, 20 grains being the probable average in 1900.

The quantity of milk reaching Manchester in 1900 was estimated at about 30,000 gallons per day; the amount of slime supplied daily to the consumer was therefore about $\frac{30000 \times 20}{7000} = 85$ lbs.

Taking the average of the last 10 years as my basis, I have come to the conclusion that samples of milk yielding sediments measuring less than 9 m.m. in diameter might be considered to be as *clean* as is practically possible, and that samples with sediments measuring not more than 7 m.m. were *very clean*. Samples with sediments measuring from 9–10 m.m. should then be considered of *doubtful cleanness*. Sediments above 10 m.m. indicate an *excessive amount of dirt*, or in some cases the presence of an unusual number of *cells presumably derived from diseased udders*.

*i.e., of moist sediments, to obtain accurate estimates it would be necessary to dry these sediments. The amount of moisture retained depends on the speed and diameter of the centrifugal machine as well as on the duration of the operation. The figures given here are comparable among themselves.

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I wish, however, to emphasize the fact that there is no constant relation between the amount of dirt and the pathogenic properties of the milk. Some milk containing a large amount of slime appears to have no pathogenic effect on experimental animals, and on the other hand many samples of milk containing a small amount of slime are highly infectious.

I wish it therefore to be clearly understood that I look upon the *amount of slime only as an indicator of the care which has been taken in the keeping of the cows, and in the collection and distribution of the milk.* I may say that I have observed the same discrepancy between the number of bacteria and the pathogenic properties of the milk. I will, on some future occasion, deal with this aspect of the question to which I have already alluded in some previous communications.

But although there is no constant relation between the amount of dirt and the pathogenic properties of the milk when individual cases are considered, there is a distinct *average correlation between the amount of dirt and the pathogenicity of milk,* and the tables will show clearly that the reduction in the amount of dirt found in the milk supplied to Manchester during the past ten years has been associated with a marked diminution in the number of samples capable of producing disease in inoculated animals.

In order to have a sufficient number of samples as a basis for calculation of percentages, I have been obliged to group the years 1897, 1898, and 1900 together.* For the same reason I have grouped the years 1901 and 1902, and 1903 and 1904 together. In this way I have obtained five periods—1897 to 1900 with 454 samples, 1901 and 1902 with 861 samples, 1903 and 1904 with 867 samples, 1905 with 764 samples, and 1906 with 704 samples. I have not been able yet to work out the results obtained in 1907, but I am under the impression that they show a further improvement.

With regard to the amount of sediment, it will be noticed that, as in case of pathogenic effects, there was about the years 1902 and 1903 some interruption in the rate of improvement.

* No samples of mixed milk were submitted to me in 1899.

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The number of samples of doubtful purity, which in 1897—1900 was about 60 per cent., had fallen to about 40 per cent. in 1901–2, and rose to 45 per cent. in 1903–4; since that period there has been a rapid fall down to 30 per cent.

With regard to the dirty milks, there has been an almost uninterrupted fall from the beginning. In 1897—1900, the average number of these milks was 12·5 per cent. In 1906 it had been reduced to less than 5 per cent. The number of very dirty milks had been reduced during the same period from $2\frac{1}{2}$ per cent. to $\frac{1}{2}$ per cent., *i.e.*, from 5 to 1.

For an account of the methods I have devised or adopted in carrying out this work, I must refer the reader to my previous publications on the subject, more especially to the following:—

"On the value of experimental tuberculosis in diagnosis." *Brit. Med. Journ.*, 1893.

"Spread of tuberculosis through the lymphatics." *Brit. Med. Journ.*, 1894; *Med. Chronicle*, 1894.

"The examination of cow's milk for the detection of pathogenic properties." *Journ. of Comp. Path.*, p. 150, 1897.

"The examination of cow's milk for the detection of tubercle bacilli." *Transactions of the Aberdeen Congress of the Royal Inst. of Public Health*, p. 221, 1900.

Regarding the dangers associated with the consumption of tuberculous or polluted milk, and to the need of more stringent administrative measures than those in force, some information will be found in several contributions which I have written from time to time, *e.g.*,

"Tuberculous infection through the alimentary canal." Address delivered to the Medico-Ethical Society, Manchester, 1892. *Med. Chronicle*, 1895.

"Prevalence of tuberculosis in the domesticated animals." *Med. Chronicle*, 1895.

"Desirability of legislation in connection with tuberculosis of living domesticated animals, and more especially of cattle." *Journ. of State Medicine*, 1896.

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"Tuberculosis and the milk supply, with some general remarks on the dangers of bad milk." *Lancet*, 1898.

"The prevention of tuberculosis." *Public Health*, 1899.

"Prevention of tuberculosis in cattle, some economic aspects of the question." *The Veterinarian*, 1899.

"The stamping out of bovine tuberculosis, with remarks on the relation of bovine to human tuberculosis." *Transactions of the British Congress on Tuberculosis, London*, 1901.

"Communicability of human tuberculosis to cattle." *Brit. Med. Journ.*, 1901.

"The bearing of outbreaks of food poisoning upon the etiology of epidemic diarrhœa." *The Journal of Hygiene*, 1903.

These references are given here for the purpose of indicating the scope of the work related to the present communication, a complete bibliography of the subject would occupy a considerable amount of space.

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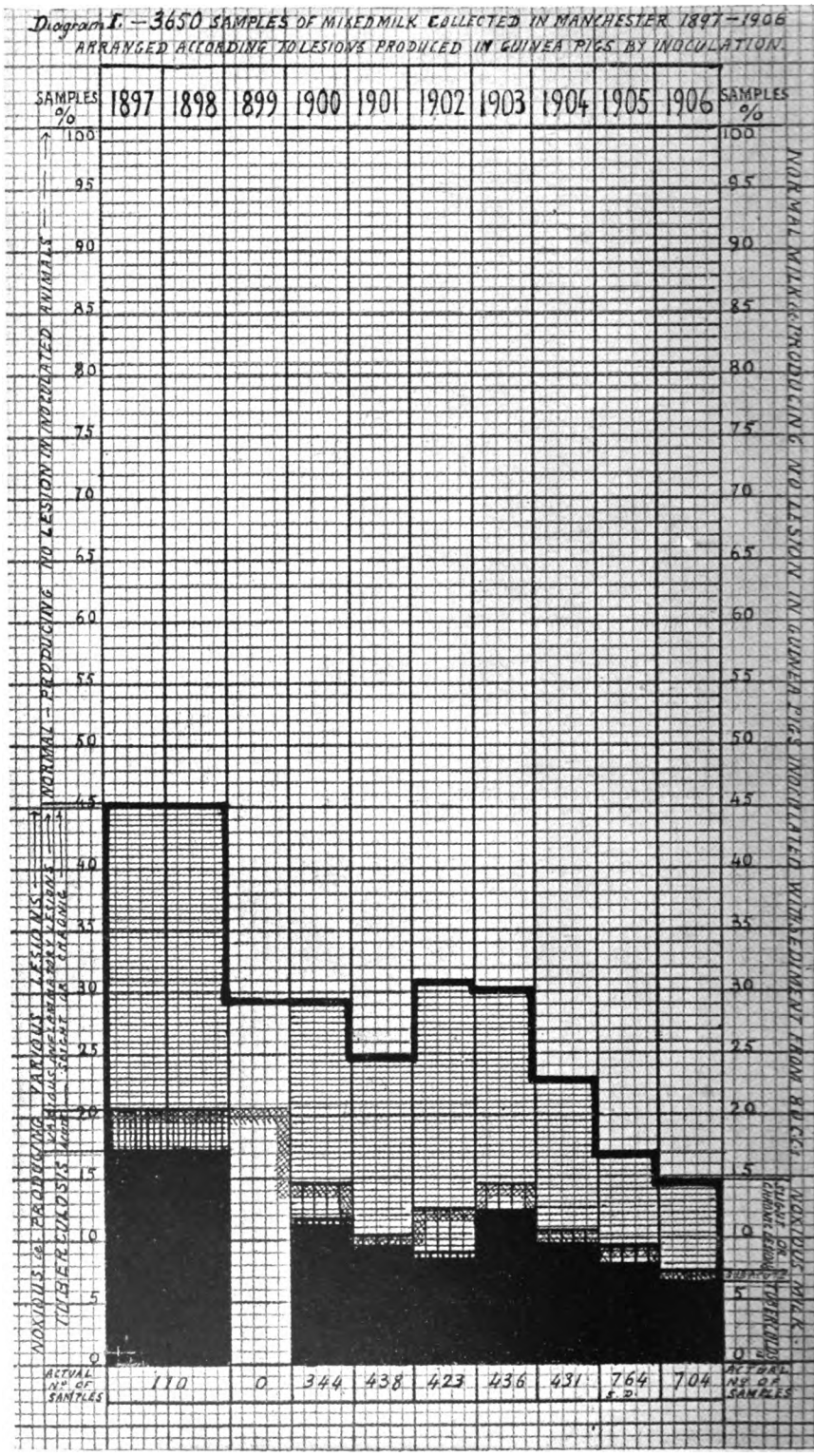

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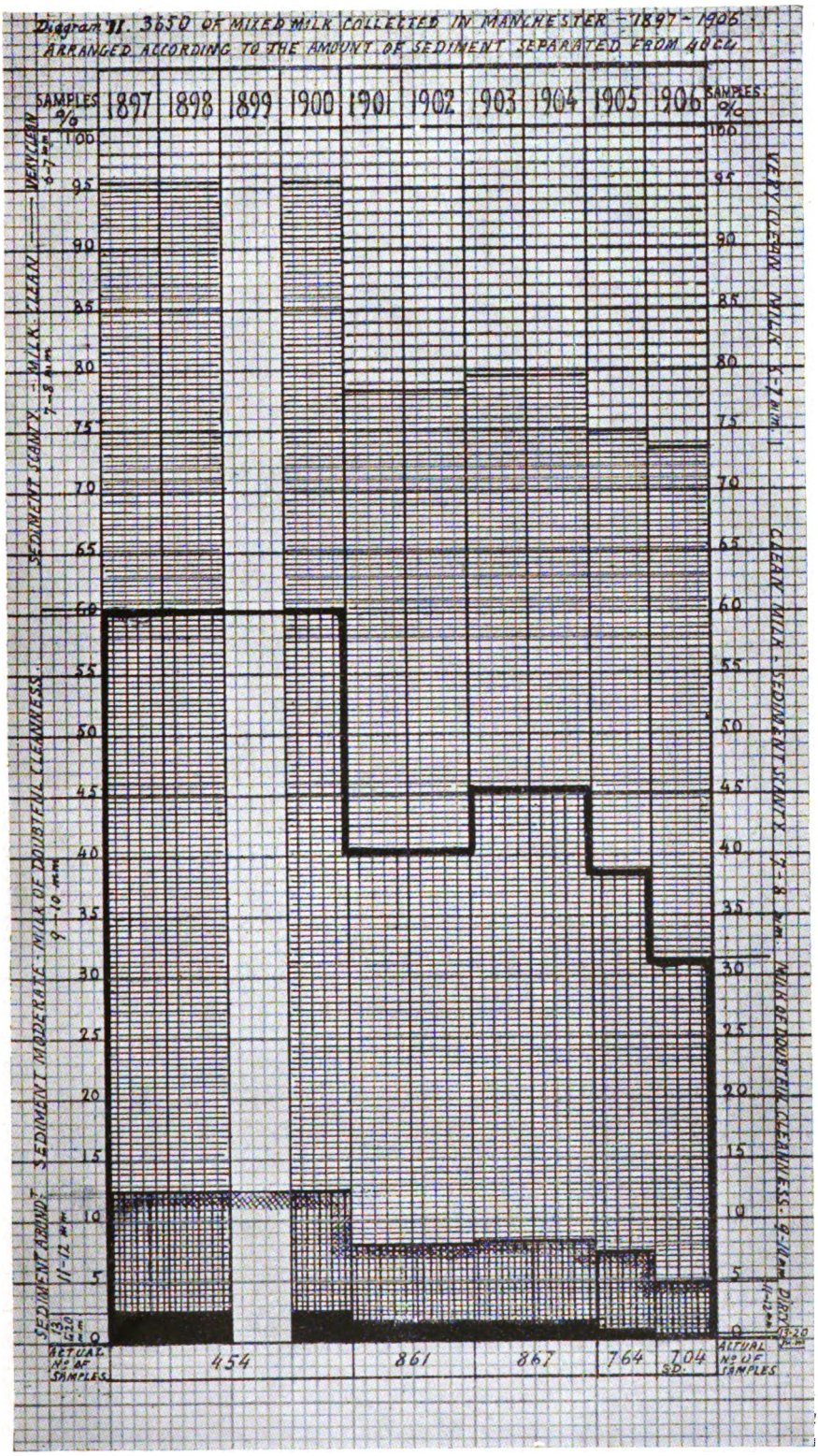

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TABLE I.—RESULTS OF INOCULATION OF GUINEA PIGS WITH THE SEDIMENT OBTAINED FROM 40 C.C.'S OF MILK IN EACH CASE.

MANCHESTER.—*Mixed Milk taken at Railway Stations and other places away from the Farm*—i.e., *Milk such as would have been supplied to the consumer in Town. In this table of gross results control samples are included.*

YEAR	GROUP I. Normal		GROUP II. Chronic		GROUP III. Sub-acute		GROUP IV. Acute		GROUP V. Tuberculous		Actual Number of Specimens Examined	REMARKS.
	Actual Number	%	Actual Number	%	Actual Number	%	Actual Number	%	Actual Number	%		
1897-8	60	54·5	27	24·5	...	...	4	3·6	19	17·2	110	GROUP I.—Normal—No lesions observed attributable to milk.
1900	243	70·5	50	14·5	10	2·9	2	0·6	39	11·3	344	GROUP II.—Chronic—Evidence of various forms of inflammation, not fatal or very slowly fatal, and clearly attributable to milk.
1901	329	75·0	64	14·6	3	0·7	...	...	42	9·5	438	GROUP III.—Sub-Acute—Various lesions attributable to milk, and fatal to one or both animals from 4 to 10 days after inoculation.
1902	292	68·0	78	18·4	15	3·5	2	0·47	36	8·5	423	GROUP IV.—Acute—Lesions attributable to milk and fatal to one or both animals within 3 days.
*1903	303	69·4	70	16·0	9	2·0	...	...	54	12·3	436	GROUP V.—Tuberculous lesions.
1904	331	76·7	53	12·2	5	1·1	...	...	42	9·7	431	
1905	633	82·8	58	7·5	12	1·5	...	...	61	8·1	764	
1906	601	84·7	50	7·0	6	0·8	...	...	47	6·6	704	
											3650	

* During this year a number of farms which had not previously been inspected were included in the operations.

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TABLE II.—AMOUNT OF SEDIMENT SEPARATED BY CENTRIFUGALISATION.

MANCHESTER.—*Mixed Milk taken at Railway Stations, or at other places away from the Farm.*

YEARS	CLEAN MILK				DOUBTFUL		MILK CONTAINED MARKED EXCESS OF DIRT OR ABNORMAL PRODUCTS.				TOTAL
	Under 7 m.m.		7-8 m.m.		9-10 m.m.		11-12 m.m.		13-20 m.m.		
	Actual No.	%	Actual No.	%	Actual No.	%	Actual No.	%	Actual No.	%	
1896-1900	19	4·2	160	35·2	218	47·9	45	9·9	12	2·6	454
1901-1902	186	21·5	325	37·7	280	32·5	53	6·1	17	1·9	861
1903-1904	164	18·9	295	34·0	326	37·5	57	6·5	15	1·7	867
1905	190	24·8	276	36·1	242	31·6	49	6·4	7	0·9	764
1906	185	26.2	296	42·0	188	26·7	31	4·4	4	0·5	704
											3650

The numbers indicating the amount of sediment show only the relative amount. The absolute amount of sediment is not given in this table.

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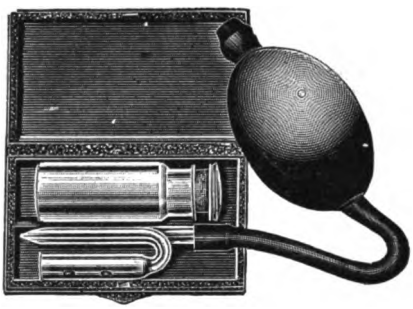

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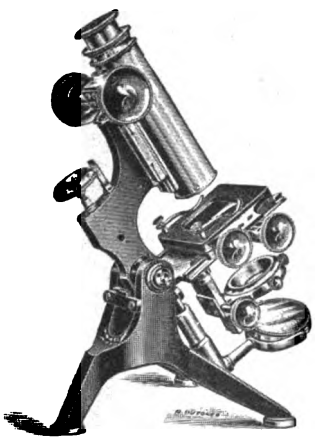

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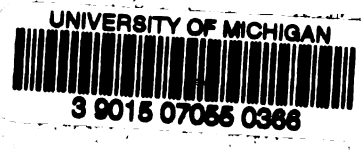

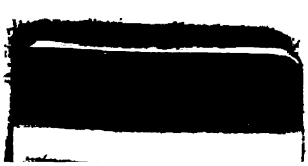
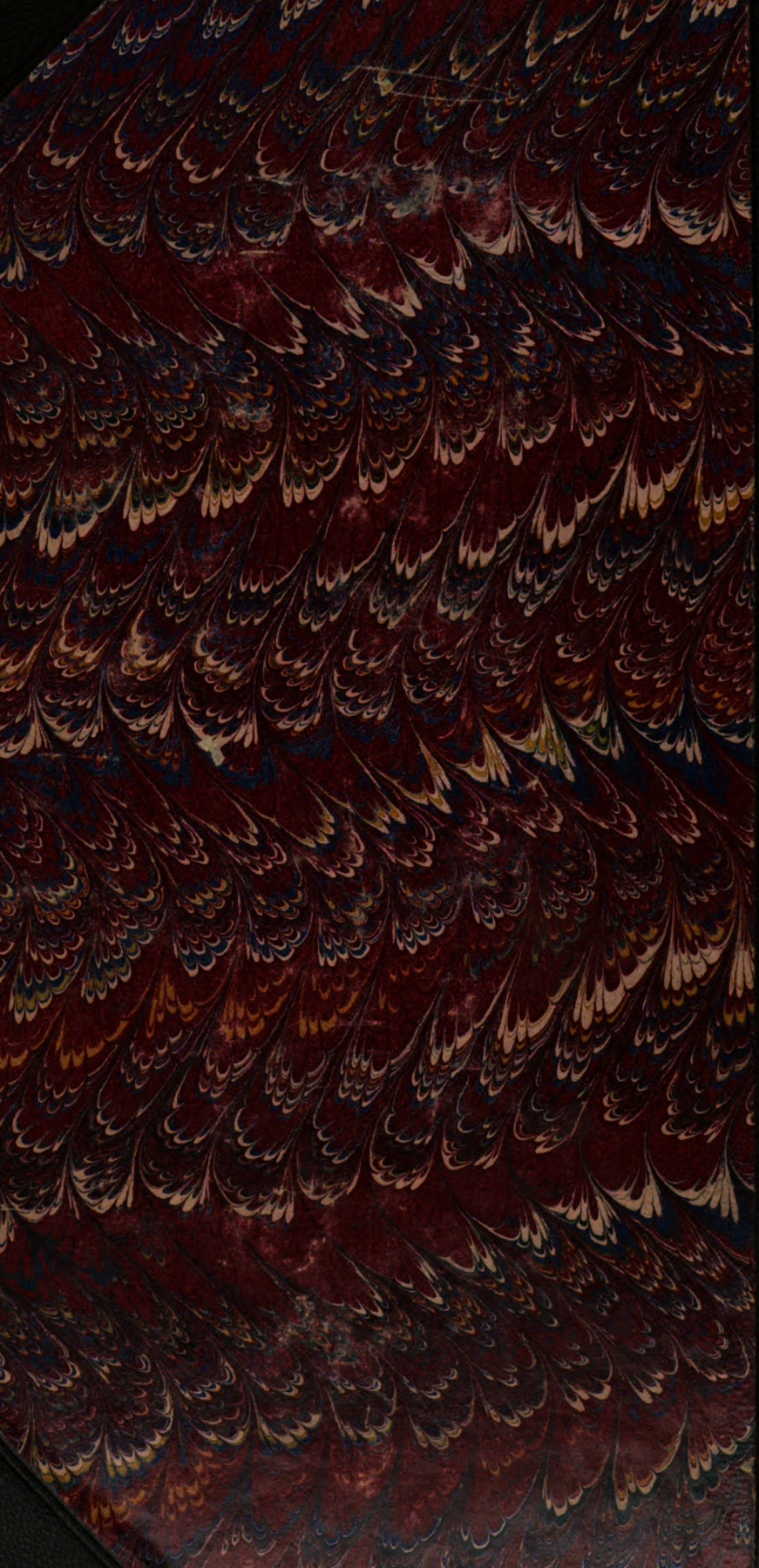
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